HP StorageWorks
C-Series iSCSI configuration guide

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Legal and notice information

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About this guide

This guide describes the basic setup and configuration for iSCSI using the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), or MDS 9216i Fibre Channel switch.

This section describes the following topics:

- Configuration guide information
- Intended audience
- Related documentation

Configuration guide information

This guide covers the following topics:

- Using the C-Series IP Storage Services Modules, Multi-Protocol Services Module and MDS 9216i switch
- Hardware and software support
- Configuration constraints
- Configuring C-Series IP Storage Services Modules, Multi-protocol Services Module and MDS 9216i switch in an HP Fibre Channel SAN

Intended audience

This document is intended for customers who have purchased an IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), or MDS 9216i switch and are planning to use the iSCSI functionality in these products.

This document assumes a thorough understanding of HP Fibre Channel storage networking products, including Fibre Channel switches and storage, as well as a basic understanding of TCP/IP networking.

Related documentation

Refer to the following Cisco documentation for more information:

- *Cisco® MDS 9000 Family Command Reference Guide*
- *Cisco MDS 9000 Family Fabric Manager Configuration Guide*
- *Cisco MDS 9000 Family Software Configuration Guide*

Additional documentation is available at the following HP web site:

http://h18006.www1.hp.com/storage/saninfrastructure.html

On the HP Storage SAN Infrastructure webpage, scroll to the C-Series Fabric section.

Using the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch in an iSCSI environment

iSCSI protocol overview

iSCSI is a SCSI transport protocol for mapping of block-oriented storage data over TCP/IP networks through iSCSI protocol data units (PDUs). The iSCSI protocol enables universal access to storage devices and storage area networks (SANs) over standard Ethernet-based TCP/IP networks. These networks may be dedicated networks or may be shared with traditional Ethernet applications. IP LAN/WAN routers and switches can be used to extend the IP storage network to a wide area of applications such as synchronous and asynchronous remote disk copy or tape backup and restore.

iSCSI in a SAN

Although the iSCSI protocol is written as a complete data transport from host to storage, this guide only discusses the current HP supported topology of iSCSI hosts to Fibre Channel storage using the C-Series IP Storage Services Modules (IPS-4, IPS-8) , Multi-protocol Services Module (14/2), and the 9216i switch.

Typical network structure

When you add iSCSI to a large SAN, you must configure and manage two data protocols: TCP/IP and Fibre Channel. IP hosts with iSCSI initiators access C-Series IP Services through an IP network connected to the C-Series Gigabit Ethernet (GbE) interface. The C-Series IP Services access Fibre Channel storage devices connected to the Fibre Channel interfaces through the FC ports within the C-Series chassis or through the FC ports of the IP switch. Figure 1 shows a typical IP/Fibre Channel network.

iSCSI Initiator

With the IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch, the IP host uses an iSCSI initiator to enable target resource recognition and attachment. The C-Series IP Services connect directly to HP's Fibre Channel SAN storage via an IP–to–worldwide port number (WWPN) translation provided by the C-Series IP Services. With this transparent SCSI forwarding, the HP Fibre Channel SAN Storage recognizes this WWPN as it would from any Fibre Channel HBA directly connected to the SAN.

LUN setup and LUN masking can now be configured with this WWPN. The iSCSI Initiator then sees these storage resources (LUNs) as if they were local drives attached directly to the server.

IP network

The IP network is the infrastructure used to transfer data between the iSCSI Initiator and the C-Series IP Services via TCP/IP. LAN switches tend to be Ethernet-based, supporting speeds from 10 Mb/s to 10 Gb/s, using copper and optical interfaces ranging in size from a few ports to hundreds of ports.

LAN switches typically support TCP/IP and other protocols, including TCP/UDP, IPX, and AppleTalk.

Other features found in many LAN switches include support for voice-over-IP (VoIP), quality of service (QoS), bandwidth management and reporting, multi-cast and jumbo frames. With the advent of SCSI storage data now being transferred within an IP network, it is important to recognize and understand the level of service necessary to avoid loss of data.

Part of the appeal that iSCSI brings to the storage market is low cost, standardized network adapters and topology hardware, in addition to years of expertise developed in deploying these networks. However, it should be stressed that existing networks must be evaluated for suitability regarding their capacity to support iSCSI storage. In any deployment, HP recommends using a dedicated Gigabit Ethernet network between iSCSI Initiators and the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), or MDS 9216i switch. This ensures adequate performance as

well as helping to provide data security. An alternative is to use IPSec to secure the connection, although there will be a performance impact.

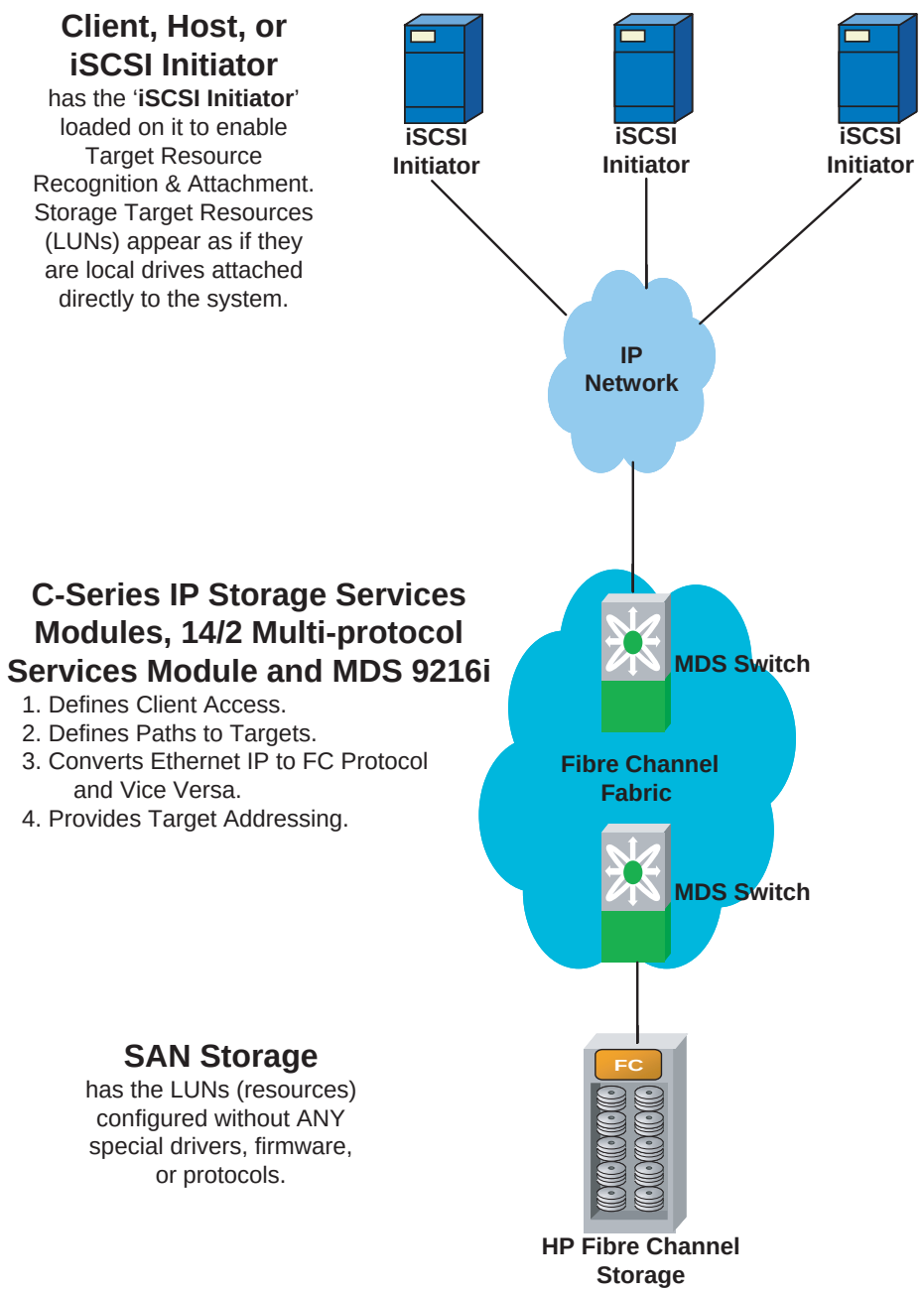


Figure 1 Typical IP/FC network structure

C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch

The IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and the MDS 9216i switch provide IP hosts access to Fibre Channel storage devices. The IP host sends SCSI commands encapsulated in iSCSI protocol data units (PDUs) to a C-Series IP port over a TCP/IP connection. At this point, the SCSI commands are transferred from an IP network into a Fibre Channel network and forwarded to the intended target. Figure 2 illustrates an IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch network.

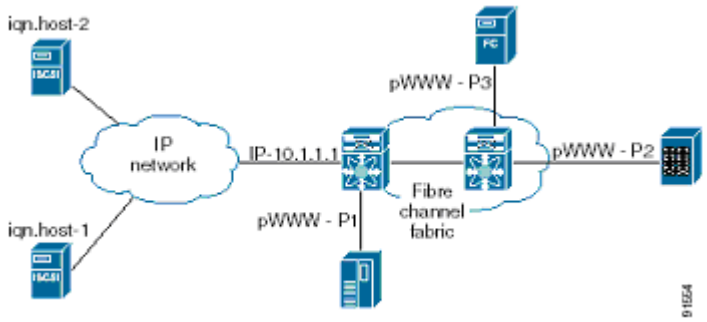


Figure 2 IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch map

In conjunction with presenting Fibre Channel targets to iSCSI hosts, the IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2) and MDS 9216i switch present each iSCSI host as a Fibre Channel host (in transparent mode), that is, as a host bus adapter (HBA) to the Fibre Channel storage device. The storage device responds to each IP host as if it were a Fibre Channel host connected to the Fibre Channel network

Fibre Channel SAN

A SAN is a dedicated, centrally managed, secure information infrastructure, which enables any-to-any interconnection of servers and storage. SANs are built to incorporate the best of both storage and networking interfaces: fast and efficient communications optimized for movement of large amounts of data, but with access to a wide range of other servers and storage devices on the network.

The C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch are supported on any currently supported HP infrastructure C-Series switch fabric.

iSCSI hardware and software support

This section lists the HP-supported hardware, drivers, and operating systems that are compatible with the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2) and MDS 9216i switch within an iSCSI environment. For further information regarding specific version and firmware information, refer to the *C-Series IP Storage Services Module, 14/2 Multiprotocol Services Module, and MDS 9216i switch support tables*, which can be downloaded from the following HP web site:

http://www.hp.com/support/manuals

In the Storage section, select the SAN Infrastructure link. Go to the C-Series section and select the link for the Cisco MDS9216i Multilayer Fabric Switch.

Storage arrays

The following HP storage array products are supported by iSCSI initiators connected to the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2) and MDS 9216i switch:

- RA/MA8000
- ESA/EMA12000
- EMA16000
- EVA3000, EVA5000
- EVA4000, EVA6000, EVA8000
- MSA1000, MSA1500
- VA7100, VA7110, VA7400, VA7410
- XP48, XP128, XP512, XP1024, XP12000, XP10000

Fibre Channel switches

The C-Series IP Storage Services Modules (IPS-4, IPS-8), and Multi–protocol Services Module (14/2) are supported with the following HP C-Series Product Line switches:

- MDS 9216, MDS 9216A, MDS 9216i Multilayer Fabric Switches
- MDS 9506, MDS 9509, MDS 9513 Multilayer Director Switches

NOTE:

The MDS 9216i switch contains two embedded IP ports.

Operating system software and iSCSI Initiator support

Refer to the HP StorageWorks C-Series iSCSI support tables located at:

http://www.hp.com/support/manuals

In the Storage section, select the SAN Infrastructure link. Go to the C-Series section and select the link for the Cisco MDS9216i Multilayer Fabric Switch.

C-Series management software

The following management software is supported:

- Cisco Fabric Manager
- Cisco Device Manager
- CLI

HP network teaming

HP NIC teaming is supported with the Windows operating system only.

Network interface controllers (NIC)

All NICs supported by HP are supported for this product. For optimal performance, HP recommends that Gigabit Ethernet NICs be used.

Multi-pathing

Multi-pathing is supported on EVA4000/6000/8000 only in a Windows environment using the Microsoft Multipath I/O driver (MPIO), supported with iSCSI. Without multi-path capabilities, the iSCSI initiator can only access one path of the storage controllers, which disables controller failover protection.

C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2) and MDS 9216i configuration constraints

C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2) and MDS 9216i constraints

Table 1 C-Series iSCSI limits

iSCSI component	Maximum
iSCSI host connections per port	200
Active LUNs per port	200
Number of Initiator/Targets (IT) Nexus per port	200
Number of active LUNs per IT Nexus	256
Number of IT Nexus/LUNs combinations per port	1200

Examples of maximum configurations for IT Nexus:

- 200 iSCSI initiators each connected to one target (storage controller port)
- 100 iSCSI initiators each connected to two targets
- 50 iSCSI initiators each connected to two targets and 100 iSCSI initiators each connected to one target

iSCSI host constraints

Table 2 iSCSI host limits for Windows 2003

iSCSI host component	Maximum
Targets accessed per host	8
LUNs per target	255

Fibre Channel switch and fabric constraints

The C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch are supported on any currently supported HP Infrastructure C-Series switch fabric. For the latest HP Infrastructure switch topologies and fabric rules, refer to the *HP StorageWorks SAN design reference guide*, which can be downloaded from the following web site:

http://h18000.www1.hp.com/products/storageworks/san/documentation.html

Configuring SANs with C-Series switches and iSCSI in a Windows environment

To configure the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2) and MDS 9216i switch in an HP Fibre Channel SAN:

1. Enable iSCSI on the C-Series switch
2. Present iSCSI hosts as virtual FC hosts
3. Install the Microsoft iSCSI initiator

4. Zone the iSCSI initiator WWPN with Fibre Channel storage WWPN
5. Create an iSCSI host

These procedures are described in the following sections. They enable you to quickly set up a basic connection between an iSCSI server and Fibre Channel storage. For advanced configuration parameters such as CHAP, VRRP, or VSANs, refer to the appropriate Cisco technical manuals and your iSCSI Initiator documentation.

NOTE:

This section uses Microsoft Windows in examples where host software is configured for iSCSI. To configure iSCSI for other operating systems, consult the host software documentation. The iSCSI configuration procedures for C-Series products are independent of the host operating system.

Enabling iSCSI on the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch

To configure the iSCSI feature, you must explicitly enable iSCSI on the required switches in the fabric. By default, this feature is disabled in all switches in the C-Series family.

The configuration and verification commands for the iSCSI feature are available only when iSCSI is enabled on a switch. When you disable iSCSI, all related configurations are automatically discarded.

To enable iSCSI on any participating switch using CLI:

1. Enter configuration mode: `switch# config t`
2. Enable iSCSI on the switch: `switch# iscsi enable`

To disable iSCSI on any participating switch using CLI: `switch# no iscsi enable`

Enabling the iSCSI interface

Before iSCSI processing begins on any physical Gigabit Ethernet interface, you must enable the corresponding iSCSI interface.

To enable an iSCSI interface:

1. Create and enable the required Gigabit Ethernet interface (slot 2, port 2):
```
switch# config terminal
switch(config)# interface gigabitethernet 2/1
switch(config-if)# no shutdown
```
2. Create and enable the required iSCSI interface:
```
switch(config-if)# exit
switch(config)# interface iscsi 2/1
switch(config-if)# no shutdown
```

Configuring the Gigabit Ethernet interface

iSCSI relies on TCP/IP for network connectivity. On each C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch, connectivity is provided in the form of Gigabit Ethernet interfaces that are appropriately configured.

NOTE:

Gigabit Ethernet ports on any C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch should not be configured in the same Ethernet broadcast domain as the management Ethernet port. HP recommends that you configure them in a different broadcast domain, either by using separate standalone hubs or switches or by using separate VLANs.

To configure IP for subsequent use by iSCSI initiators:

1. Enter configuration mode: `switch# config terminal`
2. Enter the interface configuration mode on the Gigabit Ethernet interface (slot 2, port 2): `switch(config)# interface gigabitethernet 2/2`
3. Enter the IP address (33.33.33.170) and subnet mask (255.255.255.0) for the Gigabit Ethernet interface: `switch(config-if)# ip address 33.33.33.170 255.255.255.0`
4. Enable the interface: `switch(config-if)# no shutdown`

Presenting iSCSI hosts as virtual Fibre Channel hosts

Because you are converting SCSI commands to and from an iSCSI IP server to Fibre Channel storage, the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch must map the ISCSI server's IP address to a unique WWPN that the Fibre Channel Storage recognizes.

The IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch have two modes to present iSCSI hosts in the Fibre Channel fabric: transparent mode and proxy initiator mode. HP recommends the use of transparent mode as described in this guide.

The benefit of transparent mode is that it allows a finer level of access control configuration. In transparent mode, each iSCSI host is presented as one virtual Fibre Channel host on the Fibre Channel fabric. Because of the one-to-one mapping of IP-to-WWPN translation from iSCSI to Fibre Channel, each host can have different zoning in the Fibre Channel SAN or LUN access control on the Fibre Channel storage.

Transparent mode static mapping

The C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch have two modes of mapping IP addresses: transparent-mode dynamic mapping and transparent-mode static mapping. Because the Microsoft iSCSI Initiator does not support Dynamic partitions, you must configure using transparent mode static mapping. Static mapping must be enabled for each iSCSI Initiator to guarantee persistent LUN mapping from the HP Fibre Channel controller to the iSCSI Initiator. See Configuring transparent mode static mapping for instructions.

Installing an iSCSI Initiator on a Windows server

The IP host or iSCSI Initiator uses the Microsoft iSCSI Initiator to enable target resource recognition and attachment to the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch over IP. The Microsoft iSCSI Initiator is configured with the Gigabit Ethernet IP address of each iSCSI interface running on the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i to which the host is to transport SCSI requests and responses. The iSCSI Initiator sees the storage resources (LUNs) as if they were local drives attached directly to the server.

HP configuration utility for network interface cards

With HP ProLiant servers, an iSCSI Initiator may use multiple NIC cards with HP teaming enabled for failover. The term *team* refers to the concept of multiple network adapters working together as a single network adapter, commonly referred to as a *virtual network adapter*.

Setup

Download the iSCSI Initiator from Microsoft's download page, and follow the installation instructions. The download includes copying the user guide to your local disk. You can refer to the user guide in C:\Program Files\Microsoft iSCSI Initiator\uguide.doc for further information.

The first use of the Microsoft iSCSI initiator, requires a manual log in to the Available Targets. After the Available Target logins are completed with the Restore Connection button enabled, the iSCSI Initiator automatically logs in whenever the server powers up or reboots.

During setup, the install procedure places a Microsoft iSCSI Initiator icon (Figure 3) on the server desktop as well as in the control panel. The Microsoft iSCSI Initiator also has a CLI. Refer to the user guide for more information.

Figure 3 Microsoft iSCSI Initiator icon

To install the Microsoft iSCSI Initiator:

1. Double-click the Microsoft iSCSI Initiator icon to open the iSCSI Initiator Properties window (Figure 4).

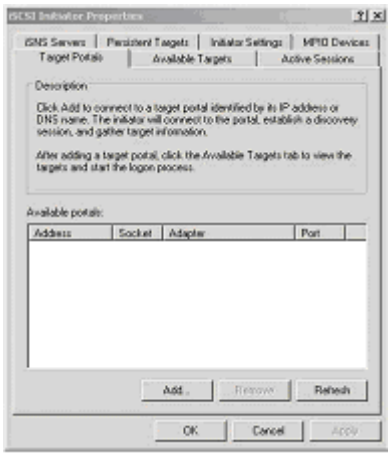


Figure 4 iSCSI Initiator Properties window

2. Click **Add** to add the IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2),, or MDS 9216i switch iSCSI Ethernet address to the initiator.

   The Add Target Portal window appears (Figure 5).

NOTE:

This example uses the GbE address (33.33.33.170).

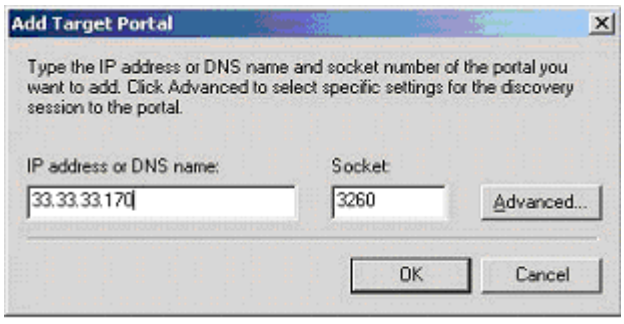


Figure 5 Add Target Portal window

3. Enter the appropriate information in the following boxes:
   - IP address or DNS name

- Socket

4. Click **OK**.

   The IP address is added to the Available Portals list (Figure 6).

   The iSCSI Initiator connects to the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2),, or MDS 9216i switch.

   The C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), or MDS 9216i switch generates a unique WWPN for the iSCSI initiator's IP address.

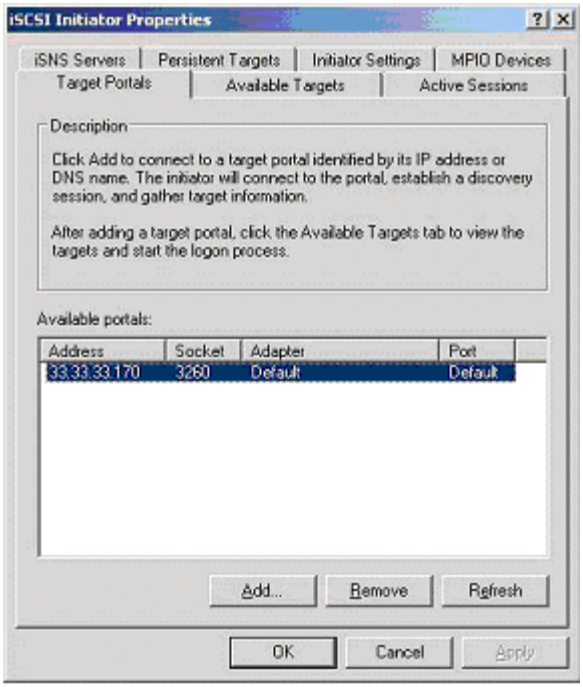


Figure 6 iSCSI Initiator Properties—Target Portals

You can verify the iSCSI connection and WWPN mapping on the IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch two ways:

- With the Device Manager GUI:
  Select **IP > iSCSI**.
  The IP iSCSI window appears (Figure 7).

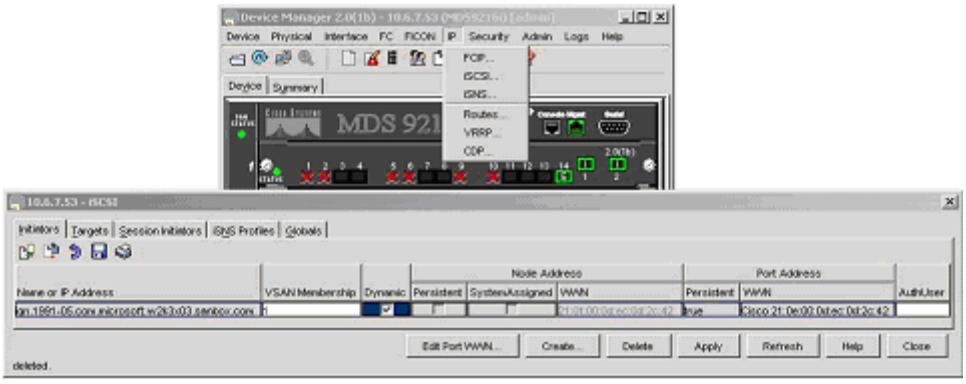


Figure 7 IP iSCSI window—Initiators tab

- With the CLI:
  Enter the `show iSCSI initiator` command.
  Example:

```
MDS9216i# show iscsi initiator
iSCSI Node name is iqn.1991-05.com.microsoft:w2k3x03.sanbox.com

Initiator ip addr (s):  33.33.33.143
iSCSI alias name:
Node WWN is 21:0f:00:0d:ec:0d:2c:42 (dynamic)
Member of vsans:  1
Number of Virtual n_ports:  1

Virtual Port WWN is 21:0e:00:0d:ec:0d:2c:42 (dynamic)
Interface iSCSI 1/1, Portal group tag:  0x0
VSAN ID 1, FCID 0x7e0015
```

IMPORTANT:

By default, transparent mode mapping is set to *Dynamic* when the initiator entry is created. Transparent mode mapping must be set to *Static* for each iSCSI Initiator to guarantee persistent LUN mapping from the HP Fibre Channel controller to the iSCSI Initiator.

Configuring transparent mode static mapping

The C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), and MDS 9216i switch have two modes of mapping IP addresses:

- Transparent mode dynamic mapping
- Transparent mode static mapping

You *must* enable static mapping for each iSCSI Initiator to guarantee persistent LUN mapping from the HP Fibre Channel storage controller. There are two ways to enable static mapping:

- With the Device Manager GUI:
  1. Select **IP > iSCSI** from the Device Manager tool bar.
     The IP iSCSI window appears (Figure 8).

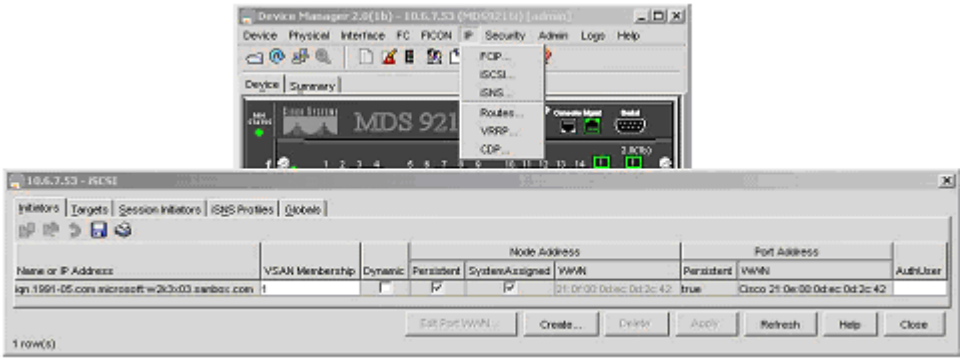


Figure 8 IP iSCSI window—Setting transparent mode static mapping

  2. Clear the **Dynamic** check box.
  3. Select the **Persistent** check box.
  4. Select the **System Assigned** check box.
  5. Click **Apply**.
  6. Close the IP iSCSI window.

7. Select **Admin > Save Configuration** from the Device Manager tool bar.

- With the CLI:
  1. Enter the `show iscsi initiator` command to view the iSCSI initiators.

     Example:
     ```
     MDS9216i# show iscsi initiator
     iSCSI Node name is iqn.1991-05.com.microsoft:w2k3x03.sanbox.com
     Initiator ip addr (s):  33.33.33.143
     iSCSI alias name:
     Node WWN is 21:0f:00:0d:ec:0d:2c:42 (dynamic)
     Member of vsans:  1
     Number of Virtual n_ports:  1
     Virtual Port WWN is 21:0e:00:0d:ec:0d:2c:42 (dynamic)
     Interface iSCSI 1/1, Portal group tag:  0x0
     VSAN ID 1, FCID 0x7e0015
     ```
  2. Use the `config terminal` command to change the iSCSI Initiator entry from *Dynamic* to *Persistent*. You can change either the iSCSI qualified name (IQN) or the IP address.

     Example:

     MDS9216i# **config terminal**

     - MDS9216i#(config) **iscsi save-initiator name iqn.1991-05.com.microsoft:w2k3x03.sanbox.com**
     - MDS9216i#(config) **iscsi save-initiator ip-address 33.33.33.143**
  3. Enter the `show iscsi initiator` command to verify the change:

     Example:
     ```
     MDS9216i# show iscsi initiator
     ```
     iSCSI Node name is iqn.1991-05.com.microsoft:w2k3x03.sanbox.com
     ```
     Initiator ip addr (s):  33.33.33.143
     iSCSI alias name:
     Node WWN is 21:0f:00:0d:ec:0d:2c:42 (configured)
     Member of vsans:  1
     Number of Virtual n_ports:  1
     Virtual Port WWN is 21:0e:00:0d:ec:0d:2c:42 (configured)
     Interface iSCSI 1/1, Portal group tag:  0x0
     VSAN ID 1, FCID 0x7e0015
     ```
  4. Enter the `save run start` command to save the configuration.

     Example:
     ```
     MDS9216i# save run start
     ```

Zoning the iSCSI Initiator WWPN with Fibre Channel storage WWPN

At this point we have a unique WWPN that acts as a virtual Fibre Channel host available on the Fibre Channel SAN. This unique WWPN can be zoned with Fibre Channel storage as if it were a Fibre Channel HBA.

NOTE:

This section uses an Enterprise Virtual Array as an example to configure iSCSI. Consult the appropriate documentation for the storage array that is actually used.

You can use either Fabric Manager or the switch CLI to create and modify SAN zones. As a best practice of SAN management, HP recommends that you create separate iSCSI zones that contain the iSCSI WWPNs and the storage WWPNs it will access. Refer to the Cisco configuration documentation to create, modify, or activate SAN zones.

NOTE:

HP does not support multi-pathing software installed on non-Windows iSCSI initiators connected to the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2), or MDS 9216i switch. iSCSI initiators can be zoned with only a single WWPN from the HP storage controller.

Figure 9 shows an example of an iSCSI initiator, *W2KX03 (33.33.33.143)*, zoned with a single port from an EVA named *HSV04*, in a zone named *iSCSI-HSV04-ONE-PORT*.

When the new zone is activated, the iSCSI Initiator can log in to the storage controller.

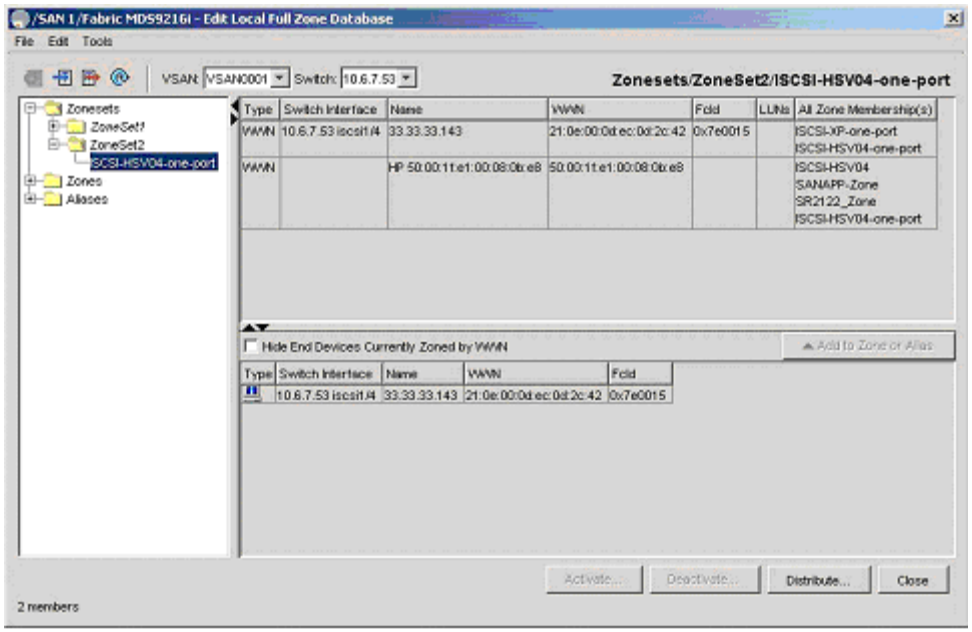


Figure 9 C-Series Zone containing iSCSI Initiator with single HSV port

Creating an iSCSI host

Configuring iSCSI storage on the EVA controller

During initial setup, the iSCSI Initiator must log in to the storage controller before the EVA can recognize the iSCSI initiator's WWPN. You can set the controller port as a Persistent Target which will permit the iSCSI Initiator to reconnect to the storage controller after a power cycle or reboot.

CAUTION:

Failure to enable Persistent Target during controller login prohibits the iSCSI Initiator from accessing storage automatically after a power cycle or reboot, requiring another login to the storage controller.

Initial iSCSI Initiator EVA login

1. From the the Microsoft iSCSI Initiator Properties window's Available Targets tab, click **Refresh**.

The iSCSI Initiator rescans the connection to the storage port. Upon successful rescan, the iqn of the storage controller port appears under Name with a status of Inactive (Figure 10).

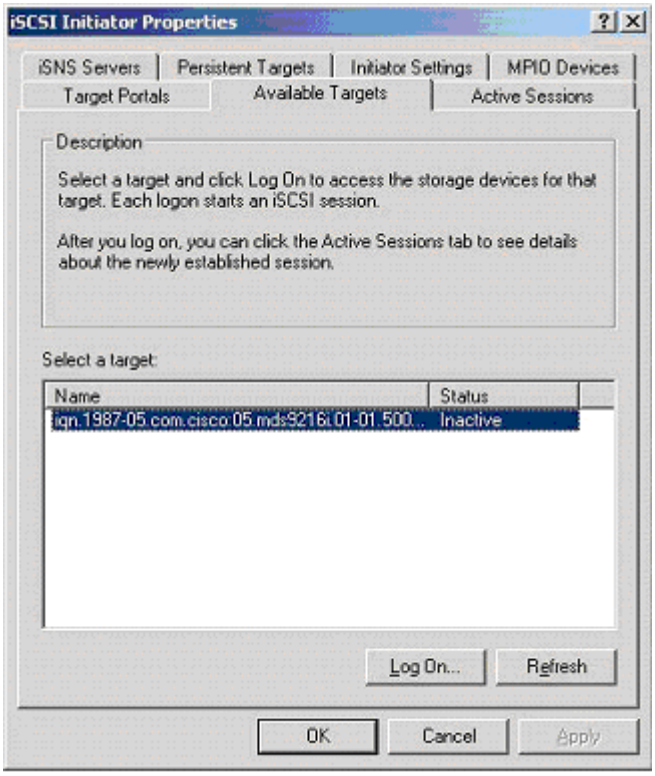


Figure 10 Available targets—Inactive status

2. Select the storage controller Name and then click **Log On**.

   The Log On to Target window appears (Figure 11).

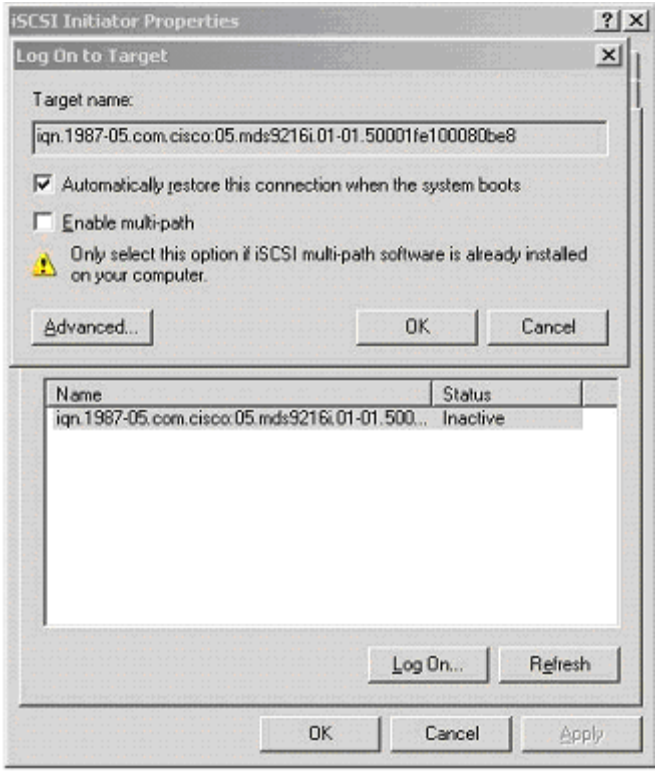


Figure 11 Log On to Target—Set persistent target

3. Select the **Automatically restore this connection when the system boots** check box to ensure that the controller port is enabled as a persistent target.
4. Click **OK**.

   The Available Target window shows the status for the storage controller iqn as Connected (Figure 12).

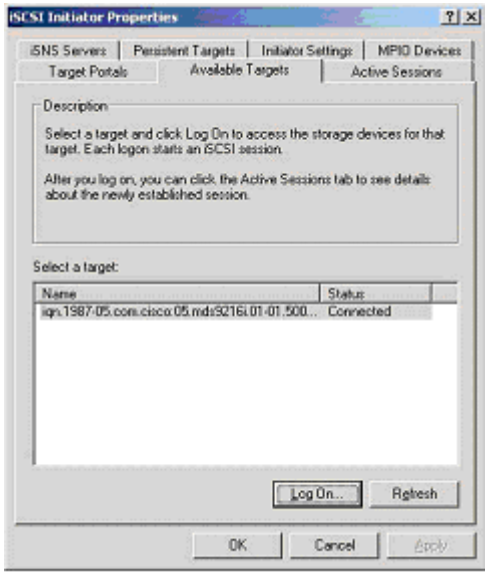


Figure 12 Available targets window—Connected status

5. Click the **Active Sessions** tab to verify the connection to the EVA.

   The storage controller session Status appears as Connected (Figure 13).

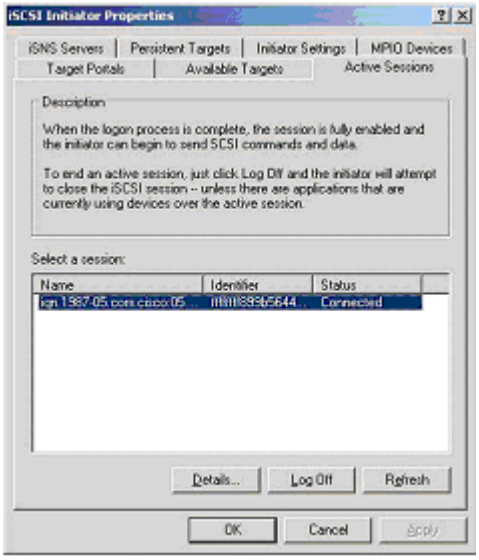


Figure 13 Active Sessions tab—Connected status

Installing the EVA CCL Drivers on the iSCSI initiator

At this point, the Windows New Hardware Found Wizard may appear, because the EVA (Command Console LUN) CCL was discovered by the operating system. This Wizard requires the following two files:

- The EVA CCL driver—HsgCCL.inf
- The Windows security file—HsgCCL.cat

These files are located on the Windows EVA Platform Kit CD. The Windows EVA Platform Kit can also be downloaded from the HP web site:

http://h20000.www2.hp.com/bizsupport/TechSupport/SoftwareDescription.jsp?locBasepartNum=co-17666-2

△ CAUTION:

Do not install the Windows EVA Platform Kit on the iSCSI server. Only extract the necessary files to complete the EVA CCL Driver installation.

The following procedure is the same if you are loading the files from the CD or downloading from the web site. To extract the HsgCCL.inf, and HsgCCL.cat files:

1. Copy the HP Package file `\Setups\cp003937.exe` to a temporary location on the iSCSI server.
2. Double click `cp003937.exe` to start the HP Package Setup.

   The HP Package Setup Window appears.
3. Click **Extract**.
4. Select or create a temporary folder, and then click **OK**.

   All files in the package are copied to the specified folder.
5. Resume the Windows Found New Hardware Wizard.

   When prompted, point it to the temporary folder where the driver and security file reside.

   Follow the instructions provided by the wizard.

Presenting EVA LUNs to the iSCSI initiator

After the iSCSI Initiator connects to the EVA controller, the EVA recognizes the iSCSI Initiator WWPN that was mapped from the C-Series IP Storage Services Modules (IPS-4, IPS-8), Multi-protocol Services Module (14/2),, or MDS 9216i switch as if it were a Fibre Channel HBA. The EVA can use the iSCSI Initiator WWPN to create a host entry and present LUNs to the host entry.

NOTE:

This section describes configuring LUNs on an EVA. For configuring LUNs on other storage products, refer to the procedures described in the product documentation.

The EVA is managed and configured with Command View EVA.

To create an EVA host entry:

1. Select the Storage Array icon and click the **Hosts** folder (Figure 14).

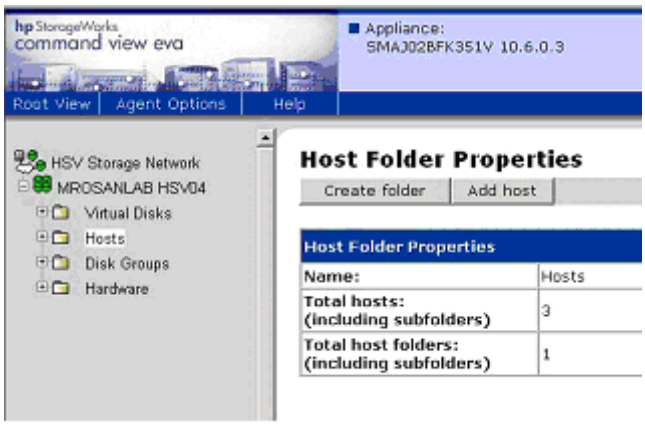


Figure 14 Host Folder—Add host

2. Click **Add host**.

   The Add a Host window appears (Figure 15).

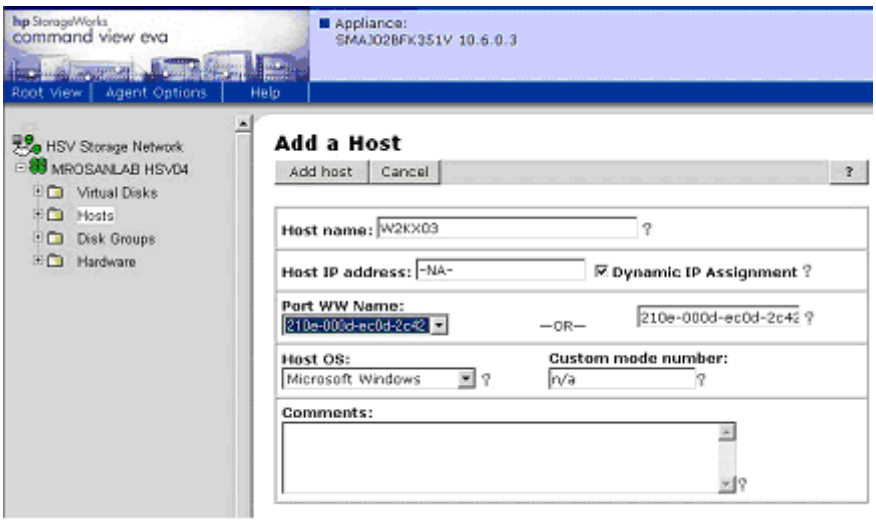


Figure 15 Add a Host window

3. Enter information into the following boxes:
   - Host name
   - Port WW Name
   - Host OS
4. Click **Add host**.

   The new Port WW Name is added to the Port WW Name list.

The host name appears in the Hosts folder (Figure 16).

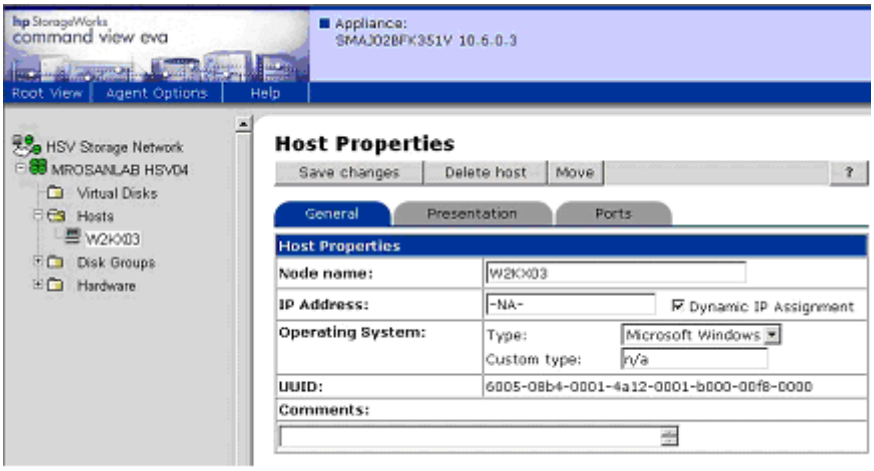


Figure 16 Hosts folder—Host Properties

Creating LUNs for assignment to the new host

To create LUNs:

1. Select the Storage Array icon and click on the **Virtual Disks** folder (Figure 17).

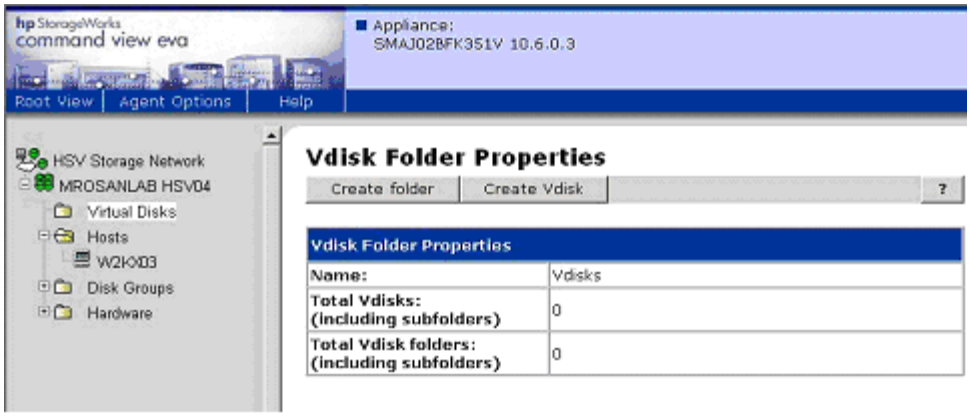


Figure 17 Virtual Disk—Folder Properties

2. Click **Create Vdisk**.

   The Create a Vdisk Family window appears (Figure 18).

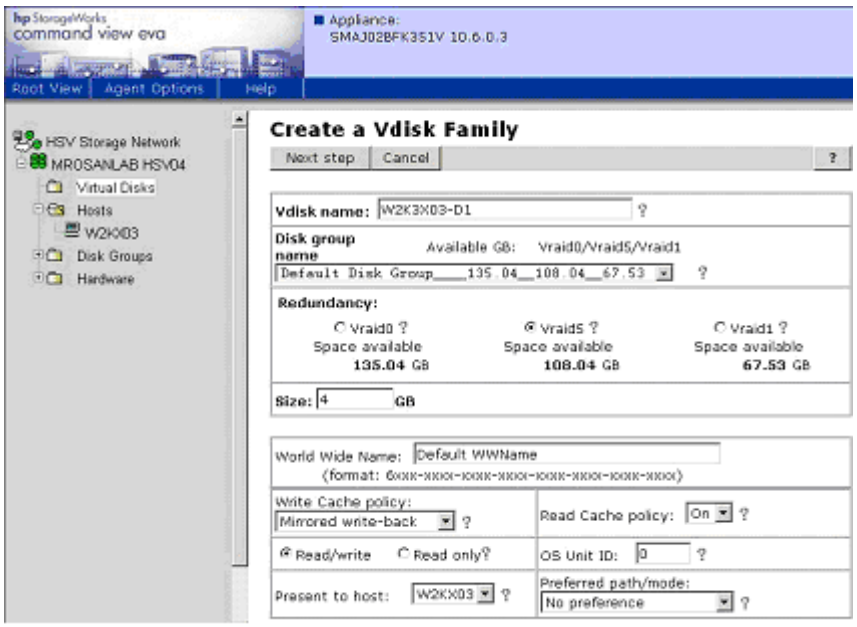


Figure 18 Create a Vdisk Family window, Page 1

NOTE:

The example in Figure 18 shows an example of creating a 4 GB Raid, 5 LUN and presenting it to the EVA iSCSI Initiator Host Entry W2K3X03.

3. Enter the information for the new vdisk in the following boxes:
   - Vdisk name
   - Size
   - Write Cache policy
   - Read Cache policy
   - Present to host
   - Preferred path/mode

   Select the appropriate redundancy

4. Click **Next step**.

   The next Create a Vdisk Family window appears (Figure 19).

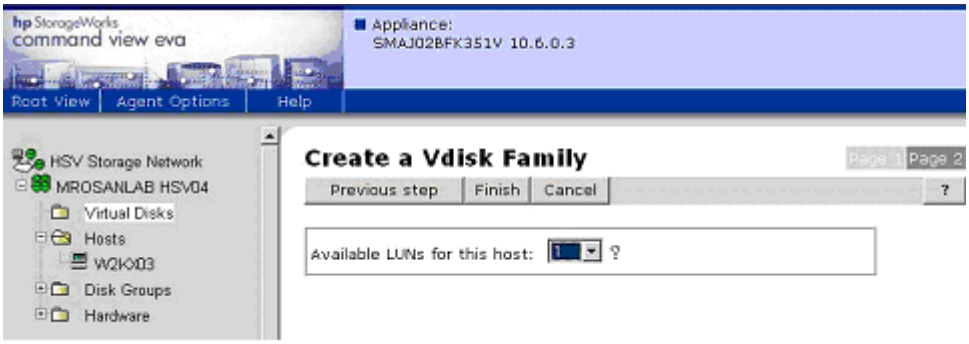


Figure 19 Create a Vdisk Family window, Page 2

5. Enter a number in the Available LUN for this host box.

   The LUN is sent to the iSCSI host.

6. Click **Finish**.

7. Repeat the procedure to create additional LUNs as needed.

The new LUNs are listed under the Virtual Disks folder (Figure 20).

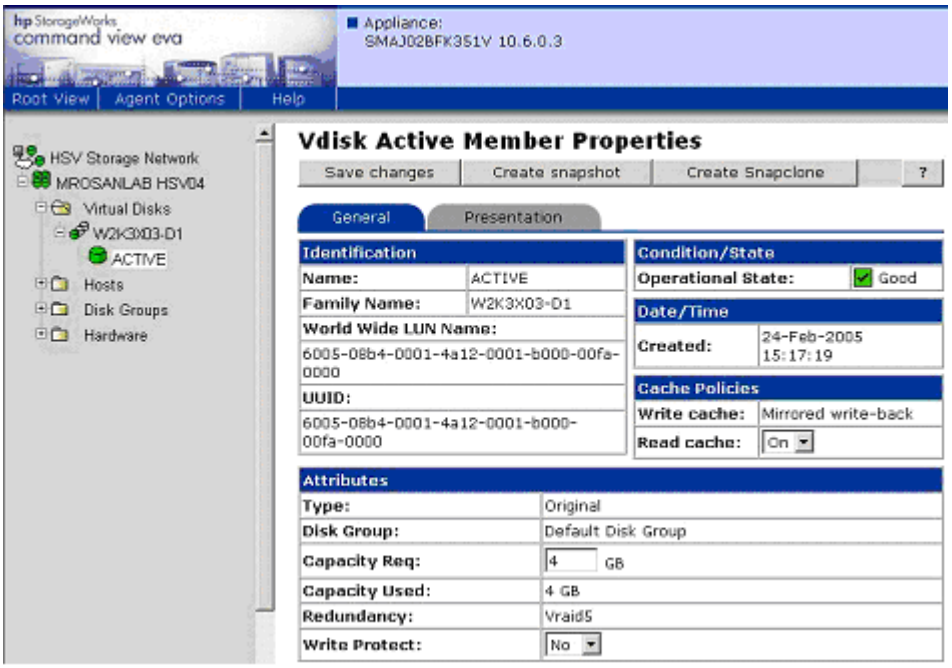


Figure 20 Vdisk Active Member Properties

The new LUN is available to the iSCSI Initiator. To verify the availability of the LUN:

1. Return to the Microsoft iSCSI Initiator Properties window.

2. Click **Active Sessions**.

3. Select the appropriate Session Name, and then click **Details**.

The LUN appears in the Session Details list (Figure 21).

NOTE:

The EVA CCL appears as an Unavailable device.

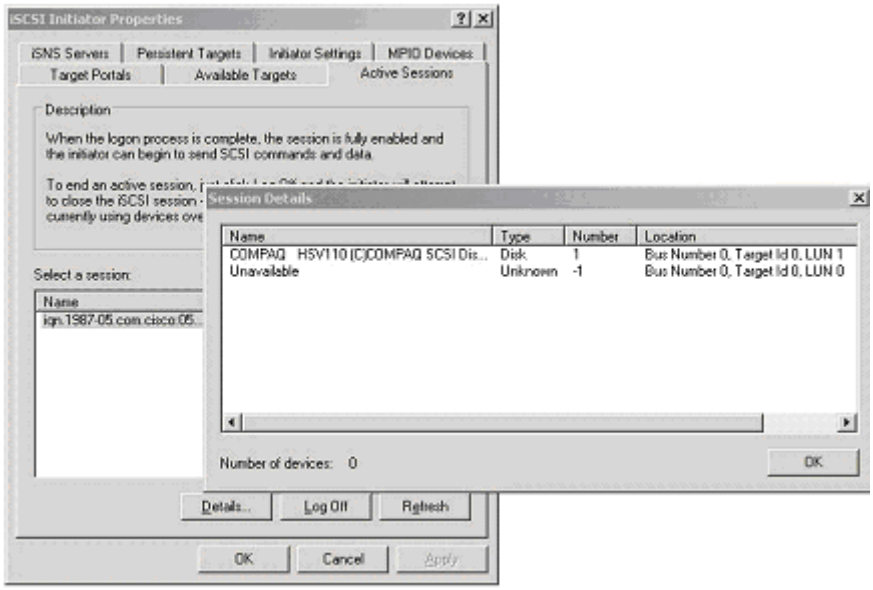


Figure 21 iSCSI Initiator Properties—Session Details

Under Windows Disk Management, the LUNs appear as initialized partitions (Figure 22). You can configure the disk partition like any other disk partition available to the operating system.

NOTE:

The Microsoft iSCSI Initiator does not support dynamic partitions.

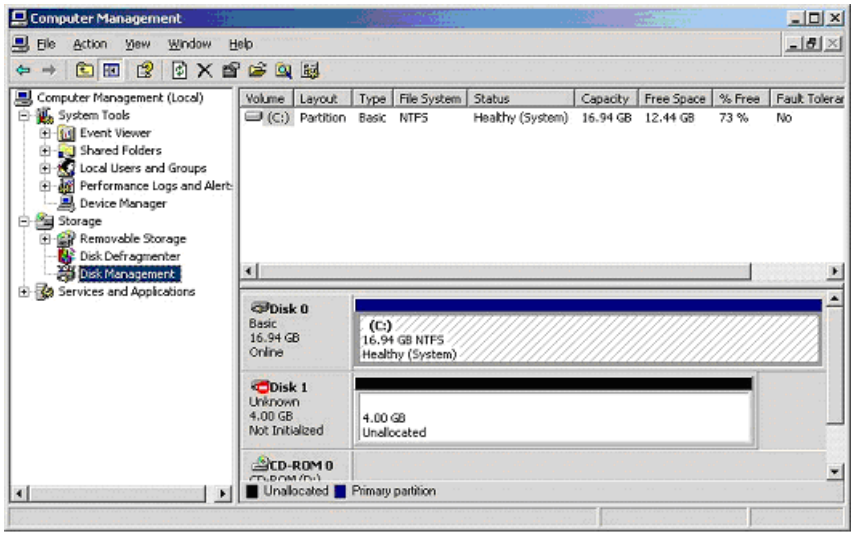


Figure 22 Windows Disk Management

Configuring SANs with C-Series switches, iSCSI, and multi-path access to EVA4000/6000/8000 storage in a Windows environment

To configure iSCSI in a Windows environment that includes multi-pathing and EVA storage:

1. "Install the Microsoft iSCSI Initiator" on page 31
2. "Enable iSCSI on the C-Series switch" on page 31
3. "Test connectivity" on page 33
4. "Present iSCSI hosts as virtual Fibre Channel hosts" on page 33
5. "Zone the iSCSI Initiator and Fibre Channel storage WWPNs" on page 36
6. "Creating an iSCSI host" on page 38
7. "Configuring p-Class Blade servers for iSCSI" on page 42

These procedures are described in the following sections. They enable you to quickly set up a basic multi-path connection between a Windows iSCSI host and Fibre Channel storage .

Be sure to verify that your planned multi-path iSCSI solution conforms to the rules in the Operating system constraints, page 30 section.

NOTE:

HP recommends using GbE NICs and IP switches in an iSCSI environment.

For advanced configuration parameters with CHAP, VRRP, or VSANs, see the appropriate Cisco documentation and the iSCSI Initiator documentation. For more information about p-Class Blade server setup and configuration, consult the p-Class Blade server documentation.

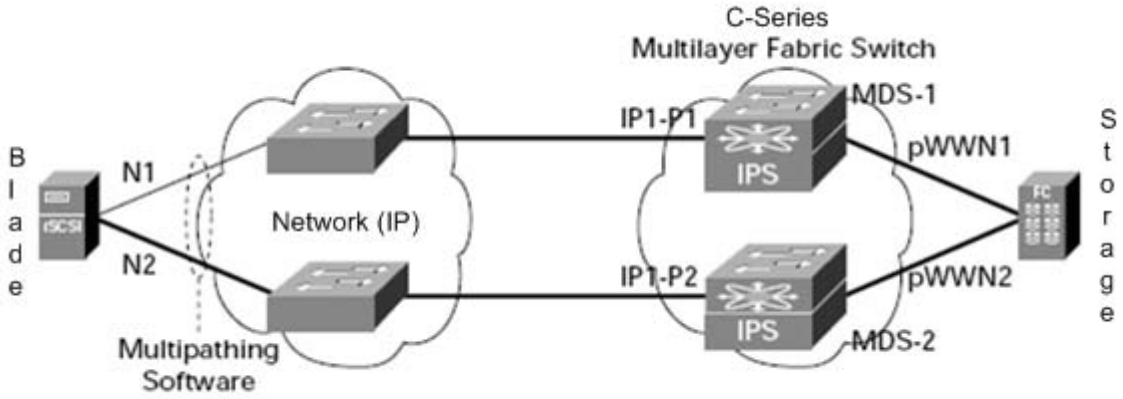


Figure 23 Multi-pathed iSCSI setup

Software constraints

The following are *not* supported:

- HP Secure Path for MSA1000/1500, RA/MA8000, EMA/ESA12000, EVA3000/5000, VA, XP
- HP Auto Path for XP/VA

- All non-HP multi-pathing products except for Microsoft MPIO for Windows

Installing the Microsoft iSCSI Initiator

The IP host uses its NICs and the Microsoft iSCSI Initiator to enable iSCSI. The Microsoft iSCSI Initiator is configured with the GbE address of each iSCSI interface that the host will access.

Setup

Uninstall any installed version of the Microsoft Initiator before installing the current version. Download the *iSCSI Initiator and User's Guide* (`uguide.doc`) from the Microsoft web site (search for "iSCSI" at www.microsoft.com) and follow the installation instructions. See "Install the Microsoft iSCSI initiator" on page 16" for more information.

In the Software Update Installation Wizard, at the Installation Options screen (Figure 24), select **Microsoft MPIO Multipathing Support for iSCSI**. By default this value is disabled.

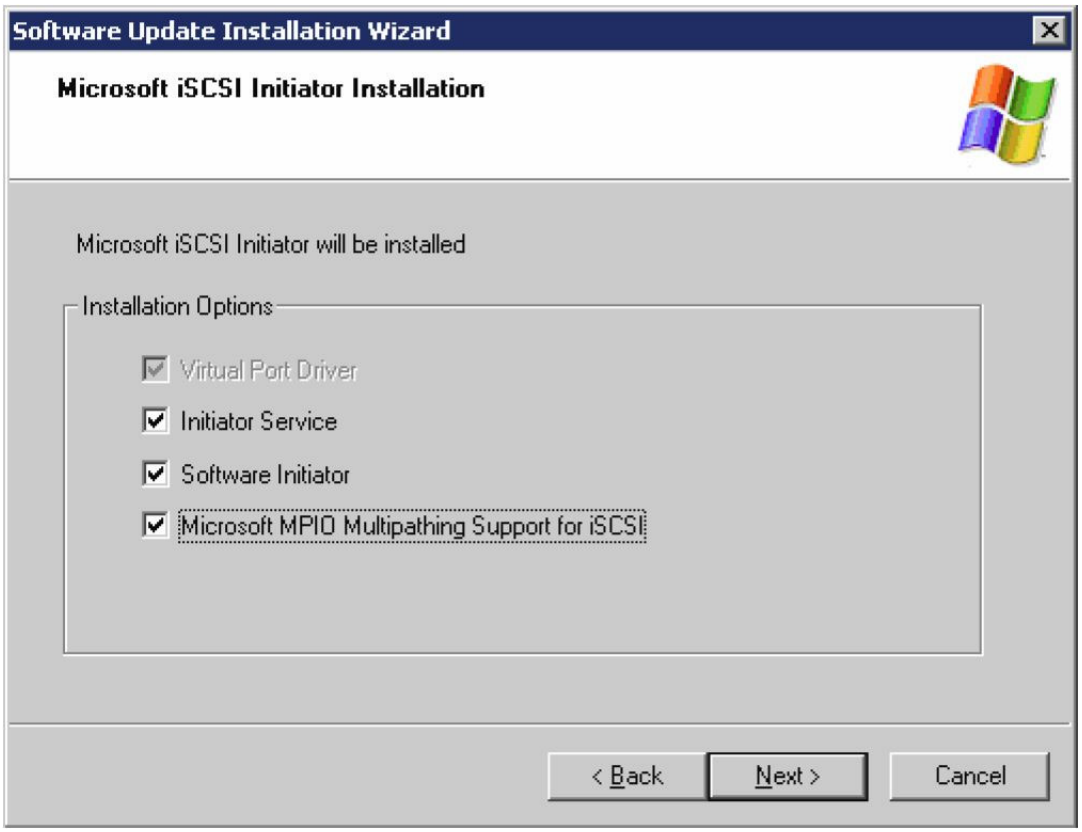


Figure 24 Enabling multi-pathing support for iSCSI

A Microsoft iSCSI Initiator icon is placed on the server desktop and in the control panel. See the Microsoft user guide for more information.

Enabling iSCSI on the C-Series switch

To enable the iSCSI feature, you must explicitly enable iSCSI on all switches connected to the iSCSI Initiators. By default, this feature is disabled on all C-Series switches.

In the example, the subnets of the switches match the static IPs assigned to the two NICs in the blade server. One switch has an IP address of 20.20.20.1 for its GigE port, and the other switch has an IP address of 20.20.21.1 for its GigE port.

The configuration and verification commands for the iSCSI feature are available when iSCSI is enabled on the switch. When you disable iSCSI, all associated configurations are automatically discarded.

To use the CLI to enable iSCSI on a C-Series switch:

1. Enter configuration mode:

```
switch # config terminal
```

2. Enable iSCSI on the switch:

```
switch (config) # iscsi enable
switch (config) # exit
```

Enabling the iSCSI interface

You must enable the iSCSI interface before traffic can flow on the GbE interface. To enable an iSCSI interface:

1. Create and enable the GbE interface:

```
switch # config terminal
switch (config) # interface gigabitethernet 2/1
switch (config-if) # no shutdown
```

2. Create and enable the iSCSI interface:

```
switch (config-if) # exit
switch (config) # interface iscsi 2/1
switch (config-if) # no shutdown
```

Configuring the Gigabit Ethernet interface

iSCSI uses TCP/IP for network connectivity. On each iSCSI-enabled C-Series switch, GbE interfaces provide connectivity.

NOTE:

GbE ports on any C-Series switch with the IP Storage Services Modules (IPS-4, IPS-8), Multi–protocol Services Module (14/2), or C-Series 9216i switch, should reside in a different Ethernet broadcast domain from the management Ethernet port. HP strongly recommends that you use separate standalone network hubs or switches, or separate VLANs, to configure the broadcast domains.

To configure the IP interface for subsequent use by iSCSI Initiators:

1. Enter switch configuration mode:

```
switch # config terminal
```

2. Enter interface configuration mode on the GbE interface:

```
switch (config) # interface gigabitethernet 2/1
```

3. Enter the IP address (20.20.20.1) and subnet mask (255.255.255.0) for the GbE interface:

```
switch (config-if) # ip address 20.20.20.1 255.255.255.0
```

4. Enable the interface:

```
switch (config-if) # no shutdown
switch (config-if) # exit
switch (config) # exit
```

5. Complete steps 1 through 4 for both C-Series GbE ports.

Testing connectivity

To test connectivity, issue the ping command from the host (ping the C-Series Fibre Channel switches) and the switches (ping the server's two IP addresses). If host and switches are able to ping each other's respective IP addresses you can proceed with the final steps.

Presenting iSCSI hosts as virtual Fibre Channel hosts

After establishing IP connectivity, you must configure the host and switches for iSCSI discovery and login.

Host side: iSCSI Initiator configuration

You must specify the iSCSI targets that the host will access.

1. Double-click the **Microsoft iSCSI Initiator** icon to open the iSCSI Initiator Properties window (Figure 25).

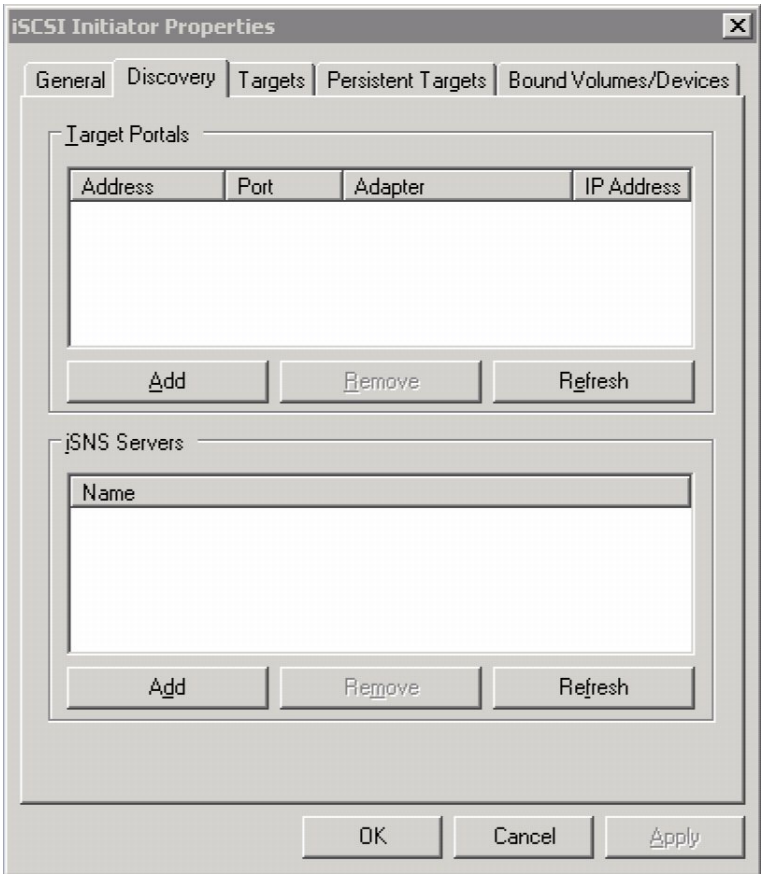


Figure 25 iSCSI Initiator Properties window

2. On the Discovery Tab, click **Add** under Target Portals. The Add Target Portal window opens (Figure 26).

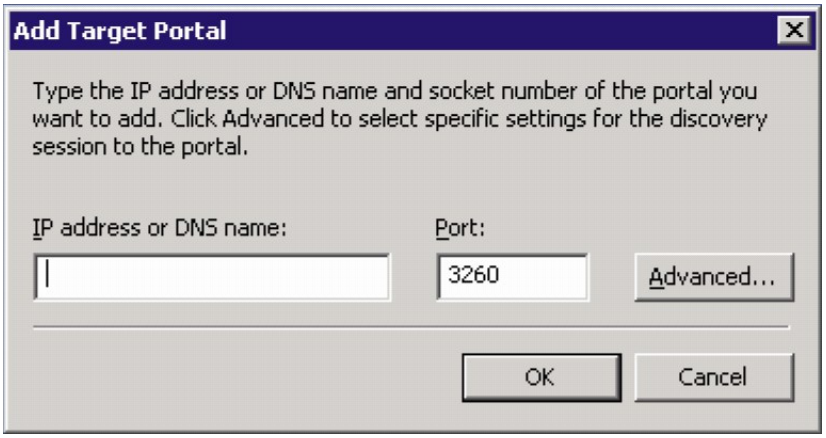


Figure 26 Add Target Portal window

3. Enter the IP address or DNS name of the first configured iSCSI GbE port.
4. Click **OK**.
5. Repeat steps 2 through 4 using the IP address or DNS name of the second configured iSCSI GbE port.
   The IP addresses are now added to the list of Target Portals (Figure 27).

The iSCSI Initiator has connected to the iSCSI-enabled C-Series switch. The switch generates a unique virtual WWPN for the iSCSI Initiator's IP address.

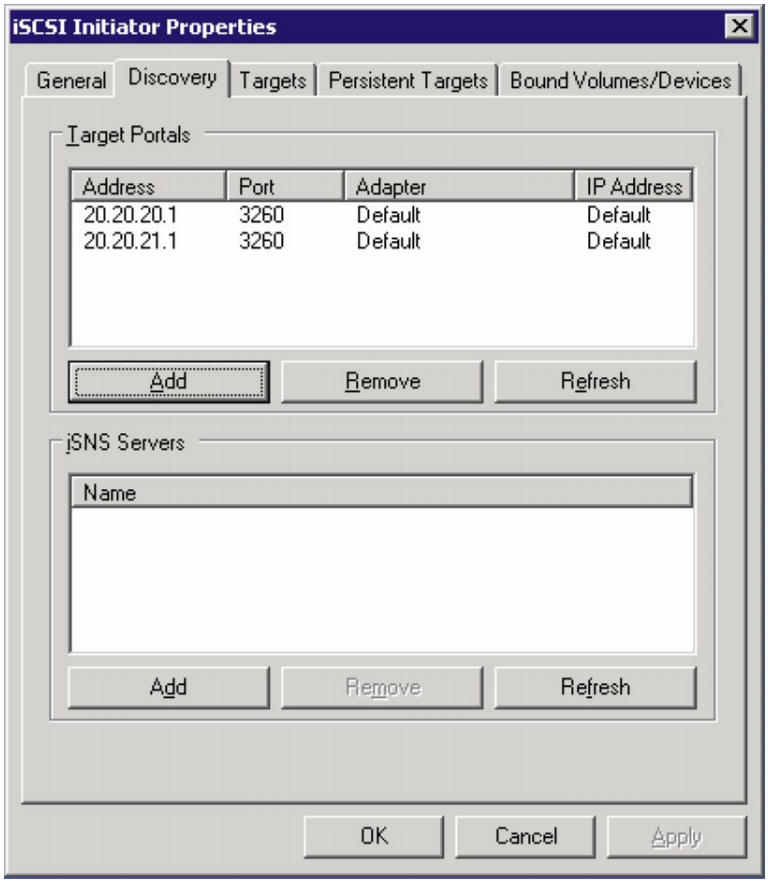


Figure 27 Both C-Series switches are target portals

C-Series switch side: configuring transparent-mode static mapping

The iSCSI-enabled C-Series switches have two modes of mapping IP addresses:

- Transparent-mode dynamic mapping
- Transparent-mode static mapping

You must enable static mapping for each iSCSI Initiator for persistent LUN mapping from the Fibre Channel storage controller.

1. Using the Cisco Device Manager, select **IP > iSCSI** from the menu bar.
   The IP iSCSI window opens (Figure 28).

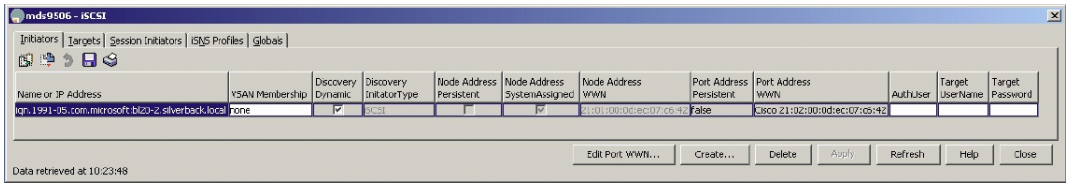


Figure 28 IP iSCSI window

2. Clear the **Discovery Dynamic** check box (Figure 29).

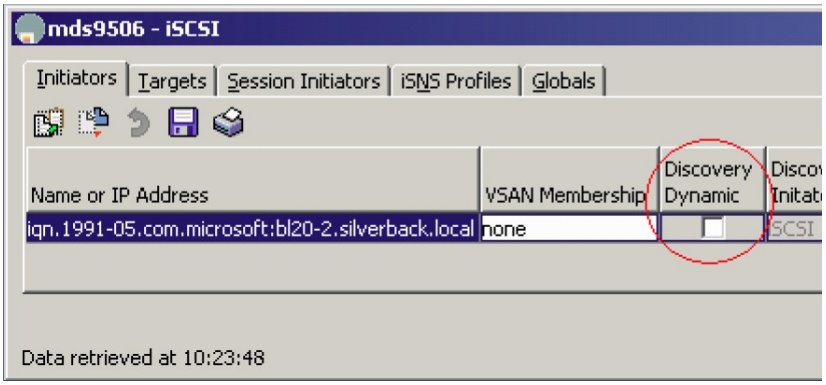


Figure 29 Discovery Dynamic check box

3. Select the **Node Address Persistent** check box (Figure 30).
4. Select the **Node Address System Assigned** check box (Figure 30).

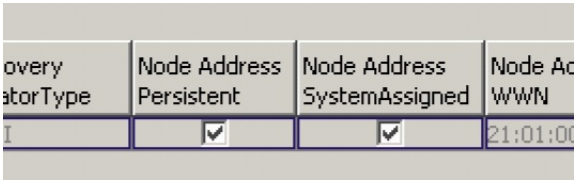


Figure 30 Node Address Persistent and Node Address System Assigned check boxes

5. Click **Apply**.
6. Close the IP iSCSI window.
7. Select **Admin > Save Configuration** from the Device Manager menu bar.
8. Configure transparent-mode static mapping on both iSCSI-enabled C-Series switches.

Zoning the iSCSI Initiator and Fibre Channel storage WWPNs

The unique WWPN of the iSCSI Initiator acts as a virtual Fibre Channel host available on the Fibre Channel SAN. The WWPN is zoned with Fibre Channel storage as if it were a Fibre Channel HBA.

Creating zones

Use either the Fabric Manager or the switch CLI to create and modify SAN zones. HP recommends creating separate iSCSI zones that contain the iSCSI WWPNs and the storage WWPNs that they access. See the Cisco configuration documentation for information on creating, modifying, or activating SAN zones. Figure 31 shows an iSCSI Initiator zoned with an Enterprise Virtual Array storage port.

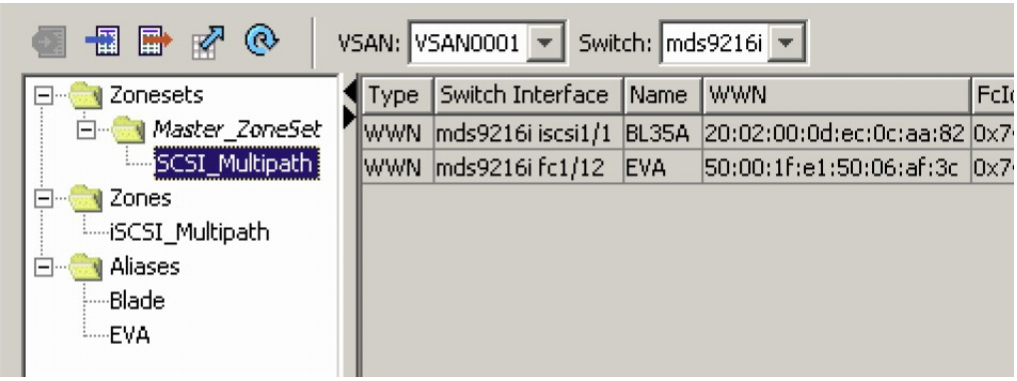


Figure 31 iSCSI Initiator zoned with an EVA storage port

Virtual targeting

Before the iSCSI Initiator can log in to the storage controller, you must create virtual targets on each C-Series Fibre Channel switch in the iSCSI window.

1. Using the Cisco Device Manager, select **IP > iSCSI** from the Device Manager menu bar. The IP iSCSI window opens (Figure 28).
2. Click the **Targets** tab (Figure 32).

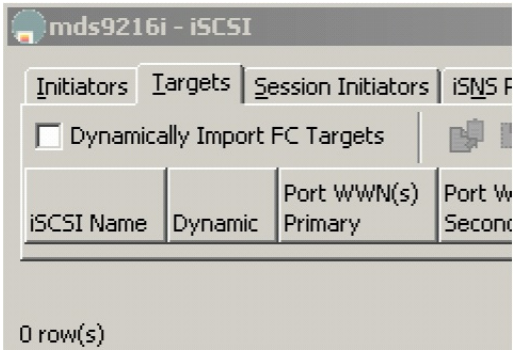


Figure 32 The Targets tab

3. Click

   Create.
   The Create iSCSI Targets window opens (Figure 33).
4. In the Create iSCSI Targets window, enter a name for the iSCSI Name box.
5. Select the target storage port from the Port WWN list.
6. Under Initiator Access, select an Initiator. Select **All** if the list is empty.
7. Under Advertised Interfaces, select the port connected to the host iSCSI Initiator.

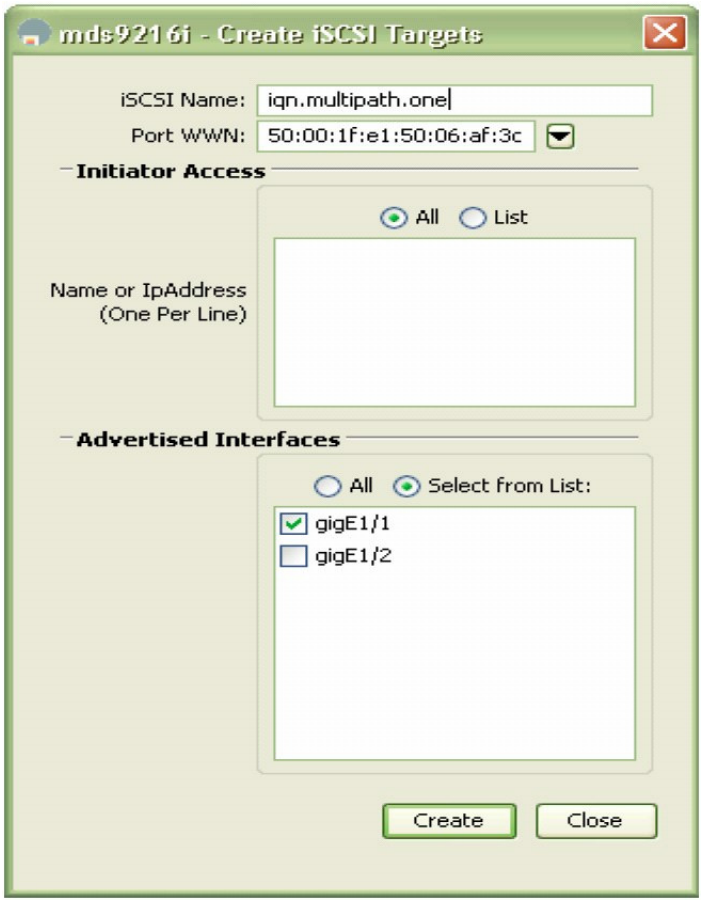


Figure 33 Create iSCSI Targets window

8. Click **Create**.
9. Select **Admin > Save Configuration** from the Device Manager menu bar.

Repeat all of the above steps for the other C-Series switch.

The iSCSI-enabled C-Series Fibre Channel switch setup is now complete.

Creating an iSCSI host

The host iSCSI Initiator must log in to the EVA storage controller before LUNs may be created.

Initial iSCSI Initiator EVA login

The iSCSI Initiator must log in to the storage controller so that the EVA storage controller can recognize the iSCSI Initiator's WWPN. By setting the controller port as a persistent target, the iSCSI Initiator will reconnect to the storage controller after a power cycle or reboot.

1. From the Microsoft iSCSI Initiator Properties window's Targets tab, click **Refresh** (Figure 34). The two virtual targets are listed (one for each C-Series switch).

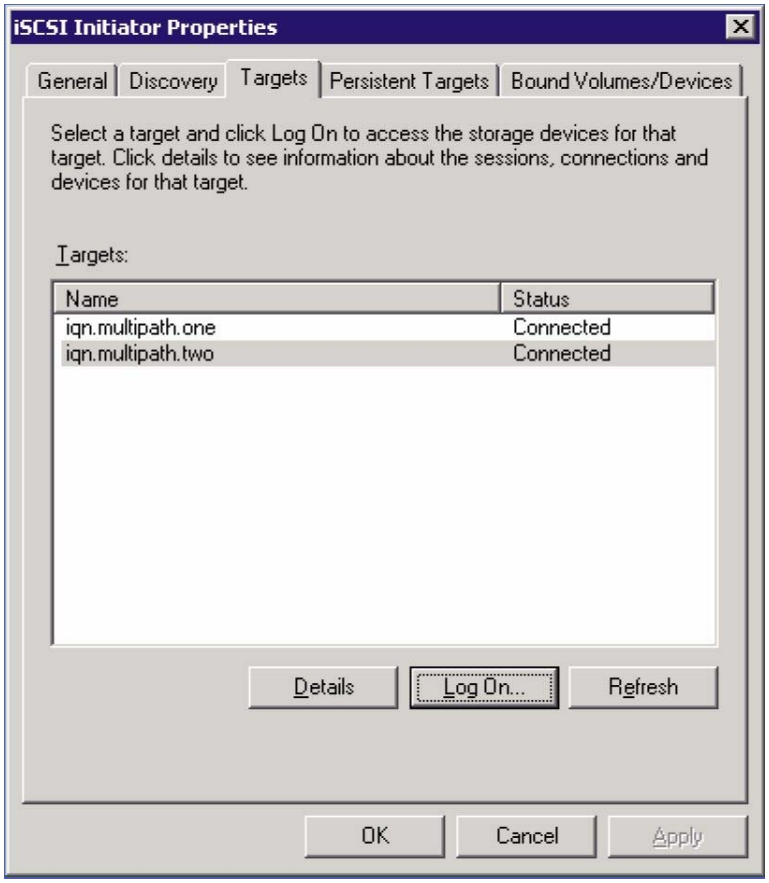


Figure 34 Virtual targets defined for host

2. Select a target and click **Log On...**.
The Log On to Target window opens (Figure 35).

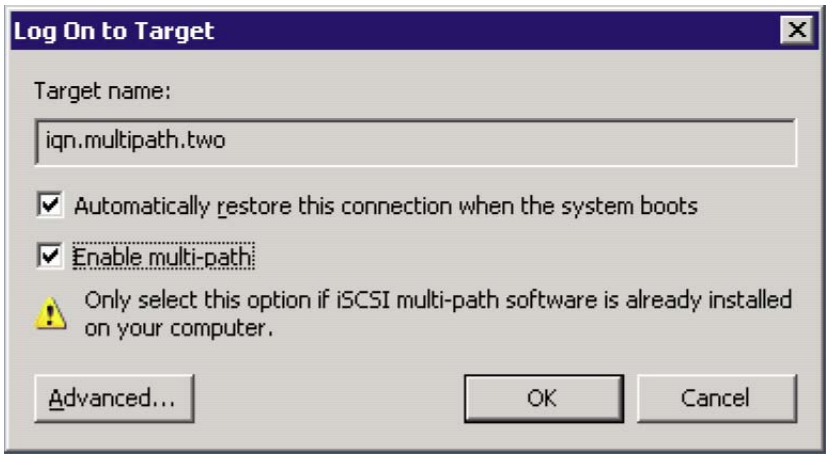


Figure 35 Log On to Target window

3. Select the **Automatically restore this connection when the system boots** and the **Enable multi-path** check boxes to ensure that the controller port is enabled as a persistent target and is able to utilize multi-pathing (Figure 35).
4. Click **OK**.
5. Repeat Steps 2 through 4 for all available virtual targets.

The Targets tab should now display the status for both storage controllers as Connected (Figure 34).

Installing the EVA CCL Driver on the iSCSI Initiator

With the targets connected to the iSCSI host, Windows discovers the EVA Command Console LUN (CCL). The New Hardware Found Wizard opens and installs the driver. This Wizard requires the following two files:

- sacd.inf – EVA CCL driver
- sacd.cat – Windows Security File

These files are located in the smart component file provided with any Fibre Channel HBA. Fibre Channel HBA smart component files are available on the HP web site.

△ CAUTION:

Do not install the smart component file on the host server. Only extract the files necessary to complete the EVA CCL driver installation.

The following procedure is the same if you are downloading the files from a CD or the web site. To extract the sacd.inf and sacd.cat files:

1. Copy the HP Package file \Setups\cp005301.exe to a temporary location on the iSCSI server.
2. Double click the **cp005301.exe** file icon to start the HP Package Setup.
3. Click **Extract**.
4. Select or create a temporary folder, and then click **OK**. All files in the package are copied to the specified folder.
5. Resume the Windows Found New Hardware Wizard. When prompted, specify the temporary folder where the driver and security files reside. Follow the wizard instructions.

Presenting EVA LUNs to the iSCSI Initiator

After the iSCSI Initiator connects to the EVA controller, the controller recognizes the iSCSI Initiator WWPN as if it were a Fibre Channel HBA. The EVA controller can use the iSCSI Initiator WWPN to create a host entry and present LUNs to the host entry.

Use Command View EVA to manage and configure the EVA. For help with Command View, please refer to the Command View EVA User Guide and related documentation.

1. In Command View, be sure to include both ports for proper multi-pathing support when adding a host (Figure 36).

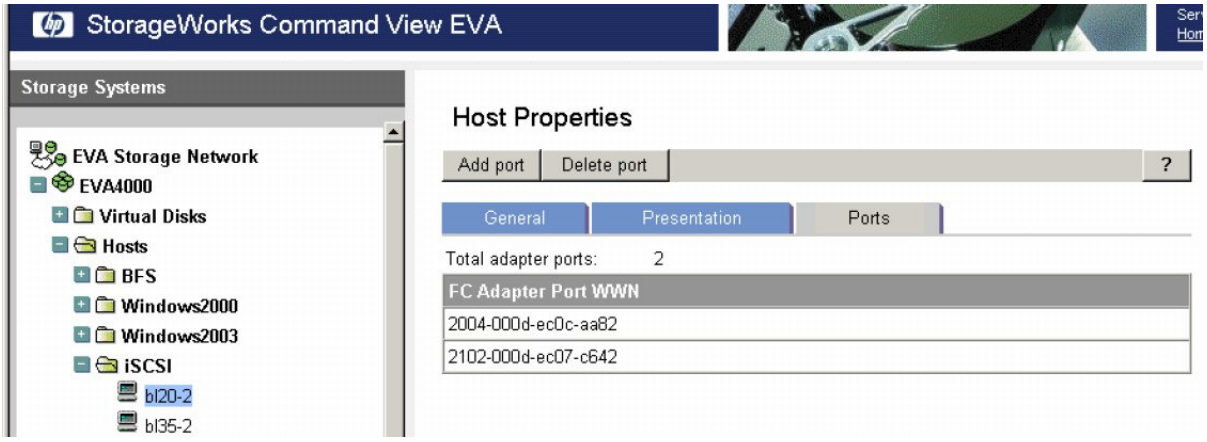


Figure 36 Both ports presented to the host

2. After configuring virtual disks and assigning them to the iSCSI Initiator return to the iSCSI host server and select **Rescan Disks** in the Computer Management window (Figure 37).

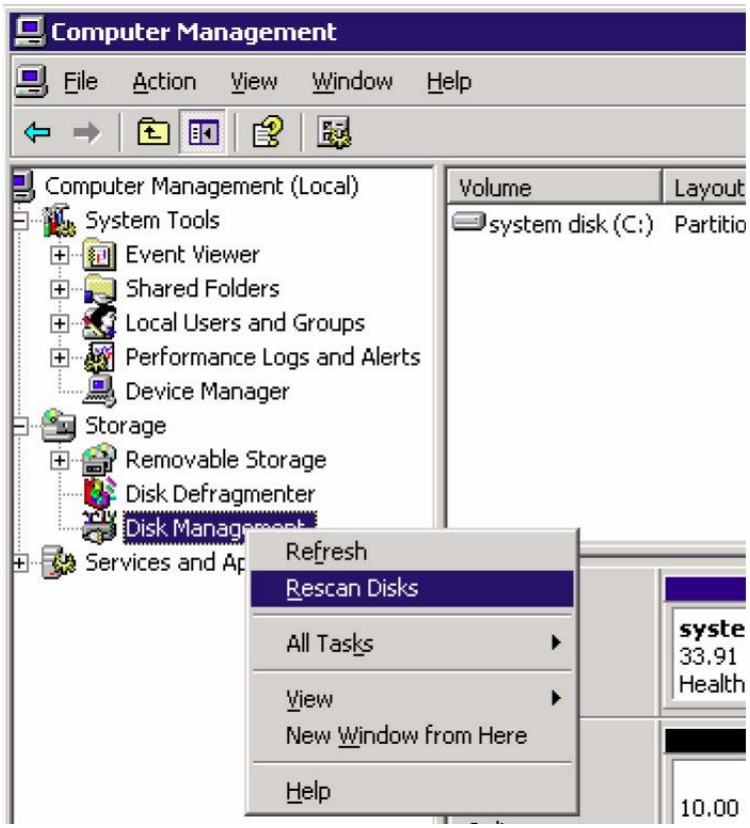


Figure 37 Rescanning disks

Setting MPIO load balancing policy

You must specify how the iSCSI targets will manage and share network traffic for the host. For both targets:

1. Open the Microsoft iSCSI Initiator Properties window.
2. Click the **Targets** tab.
3. Select a target and click **Details**.
   A Target Properties window opens.
4. Click the **Devices** tab.
5. Select the appropriate device and click **Advanced**.
   A Device Details window opens.
6. Select a load balance policy from the list (Figure 38).

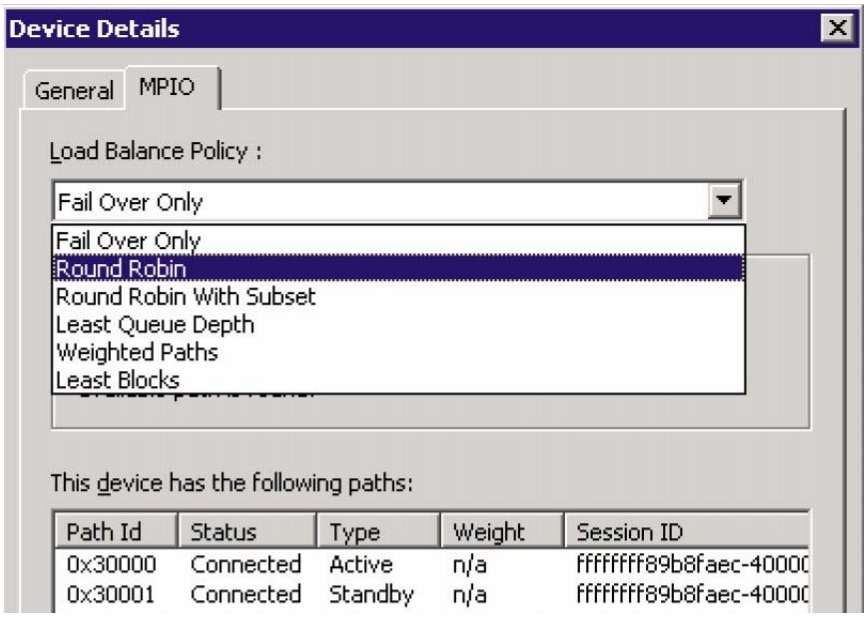


Figure 38 Selecting Load Balance Policy

7. Repeat steps 3 through 6 for the other target.
8. On the iSCSI-enabled C-Series Fibre Channel switch in the **IP > iSCSI** window, click the **Session Initiators** tab to verify C-Series iSCSI sessions (Figure 39).

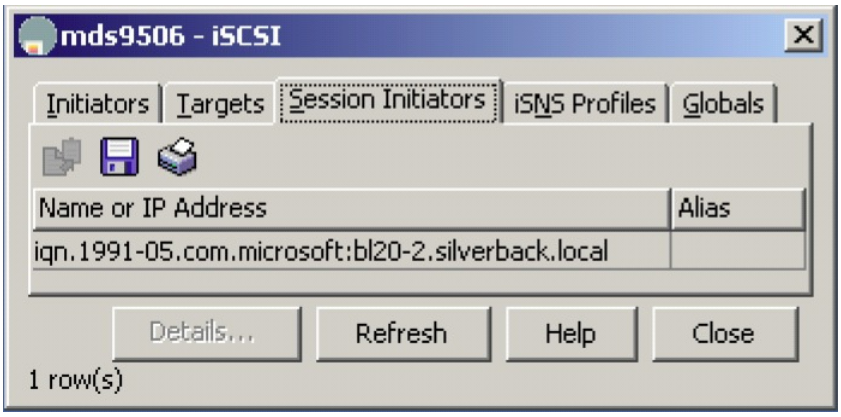


Figure 39 Verifying C-Series iSCSI sessions

Configuring p-Class Blade servers in an iSCSI environment

This section describes the procedures to prepare a p-Class Blade server for inclusion in an iSCSI environment. Each Blade server enclosure has a pair of network interconnects located at the left most and right most positions in the enclosure. They transmit and receive all Ethernet and Fibre Channel signals between installed Blade servers. The interconnect modules are based on either the Cisco Gigabit Ethernet Switch Module (CGESM) or the Gibabit Ethernet 2 (GbE2) standards.

Configuring p-Class Blade CGESM server enclosure interconnects

This section describes a configuration example using CGESM interconnects. For details on the configuration or installation of the interconnects, see the specific Blade server documentation.

Setup

If you are not using DHCP, follow the setup instructions in the *Cisco Gigabit Ethernet Switch Module for HP p-Class BladeSystem Software Configuration Guide*, to assign the CGESM an IP address. Use a web browser to access the configuration management and operation features at http://10.10.10.168:80, where 80 is the default port number.. Use the web interface to disable the cross connection (XConnects) (ports 17 and 18) and to ensure all ports are in the same VLAN.

Disabling the cross connection ports

With XConnects between Interconnect A and Interconnect B, the multi-path solution may use loops established at the interconnect switching level. To avoid this, disable the XConnects. Each interconnect model has different XConnect ports. Some interconnects don't enable these ports by default. The following procedure assumes the use of CGESM. See the interconnect documentation for more information.

1. Log in to the first interconnect on the web switch web page at http://10.10.10.168:80.
2. Click the Configuration link in the left frame of the web page.(Figure 40).

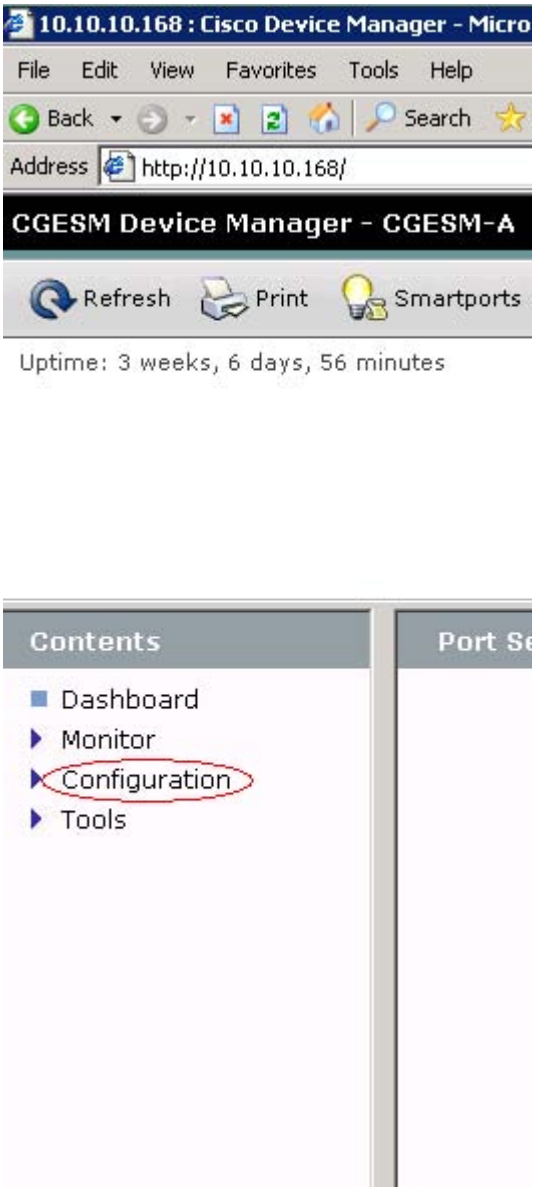


Figure 40 Switch web page

3. Click 'Port Settings'.
4. Disable port 17 and port 18 (Figure 41).

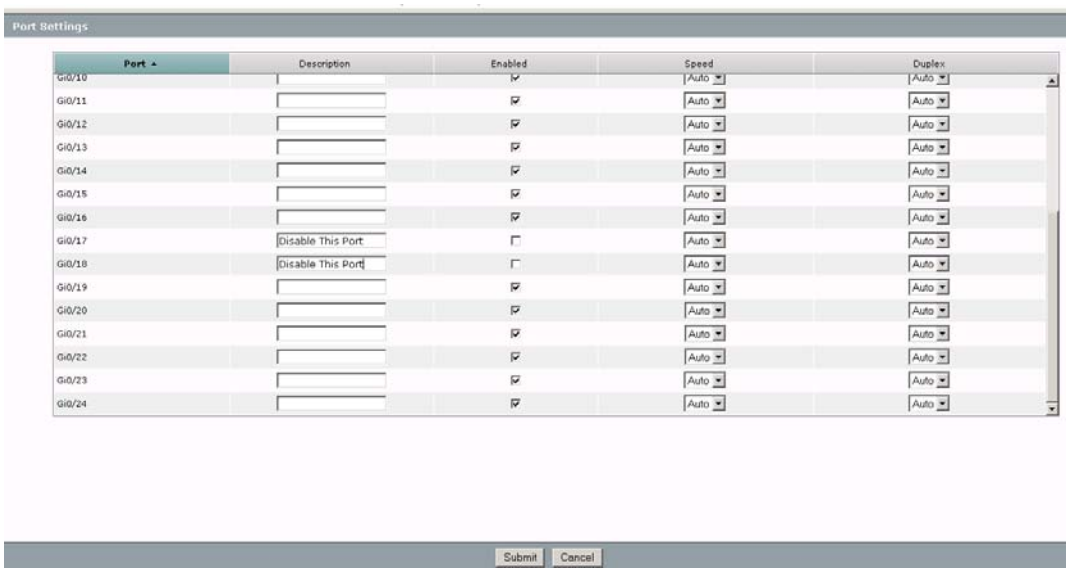


Figure 41 Disabling a port

5. Click Submit (Figure 41).

Verifying VLAN settings

After disabling the XConnects, verify that each port used in the iSCSI setup is enabled and is part of the same VLAN. To verify:

1. From Windows **Start**, select **Run**.
2. Enter "telnet" in the Run dialog box.
3. Log in to Interconnect A or B and run the command "show vlan" (Figure 42).

NOTE:

All ports are members of the same VLAN and are in VLAN 1 by default.

Verify the VLAN settings for Interconnects A and B.

```
CGESM-A>show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gi0/1, Gi0/2, Gi0/3, Gi0/4
                                                Gi0/5, Gi0/6, Gi0/7, Gi0/8
                                                Gi0/9, Gi0/10, Gi0/11, Gi0/12
                                                Gi0/13, Gi0/14, Gi0/15, Gi0/16
                                                Gi0/17, Gi0/18, Gi0/19, Gi0/20
                                                Gi0/21, Gi0/22, Gi0/23, Gi0/24
```

Figure 42 Interconnect telnet session

Configuring p-Class Blade GbE2 server enclosure interconnects

This section describes a configuration example using GbE2 interconnects. For details on the configuration or installation of the interconnects, see the specific Blade server documentation.

Setup

Using the setup instructions in the *HP ProLiant BL p-Class GbE2 Interconnect Switch Application Guide*, enable the Browser-Based Interface (BBI). Access the configuration management and operation features of the switch through the BBI and your Web browser. Use the web interface to disable the cross connection

(XConnects) (ports 17 and 18) and to ensure all ports are in the same VLAN. For information on the BBI see the *HP ProLiant BL p-Class GbE2 Interconnect Switch Browser-based Interface Reference Guide*.

Disabling the cross connection ports

With XConnects between Interconnect A and Interconnect B, the multi-path solution may use loops established at the interconnect switching level. To avoid this disable the XConnects. Each interconnect model has different XConnect ports. Some interconnects don't enable these ports by default. The following procedure uses the GbE2. See the interconnect documentation for more information.

1. Log in to the first interconnect through the BBI.
2. Click the **CONFIGURE** tab on the BBI main window (Figure 43).

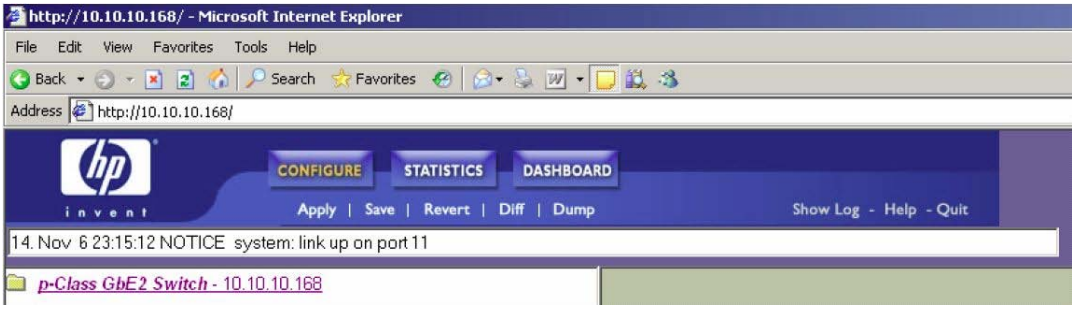


Figure 43 BBI main window

3. Click the folder icon next to *p-Class GbE2 Switch*.
4. Navigate to the Switch Ports icon in the Switch folder (Figure 44).

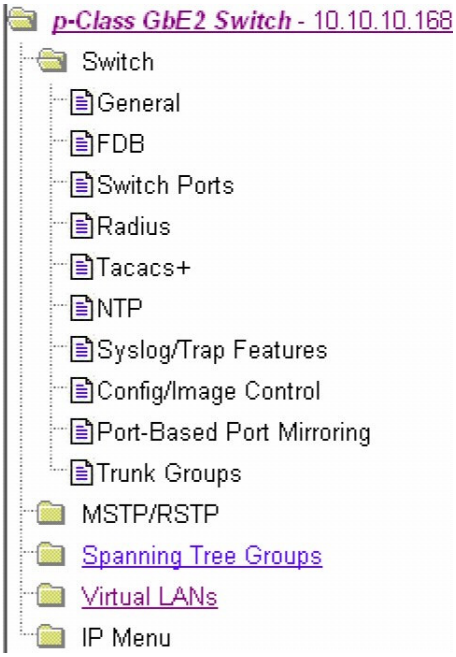


Figure 44 Switch Ports icon location

5. Disable Switch Port State for ports 17 and 18 (Figure 45).

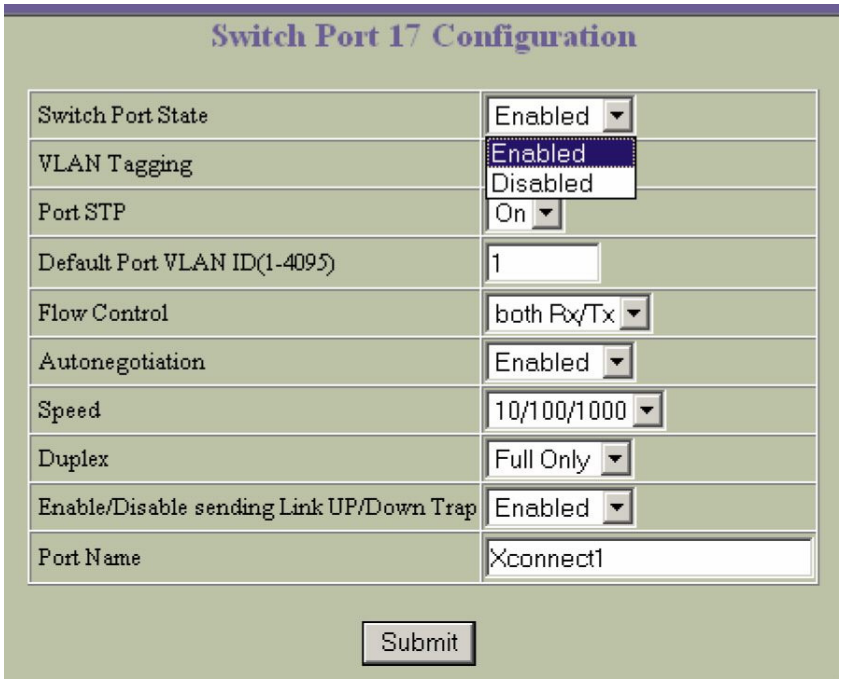


Figure 45 Disabling a port

6. Click **Apply** and then click **Save**.

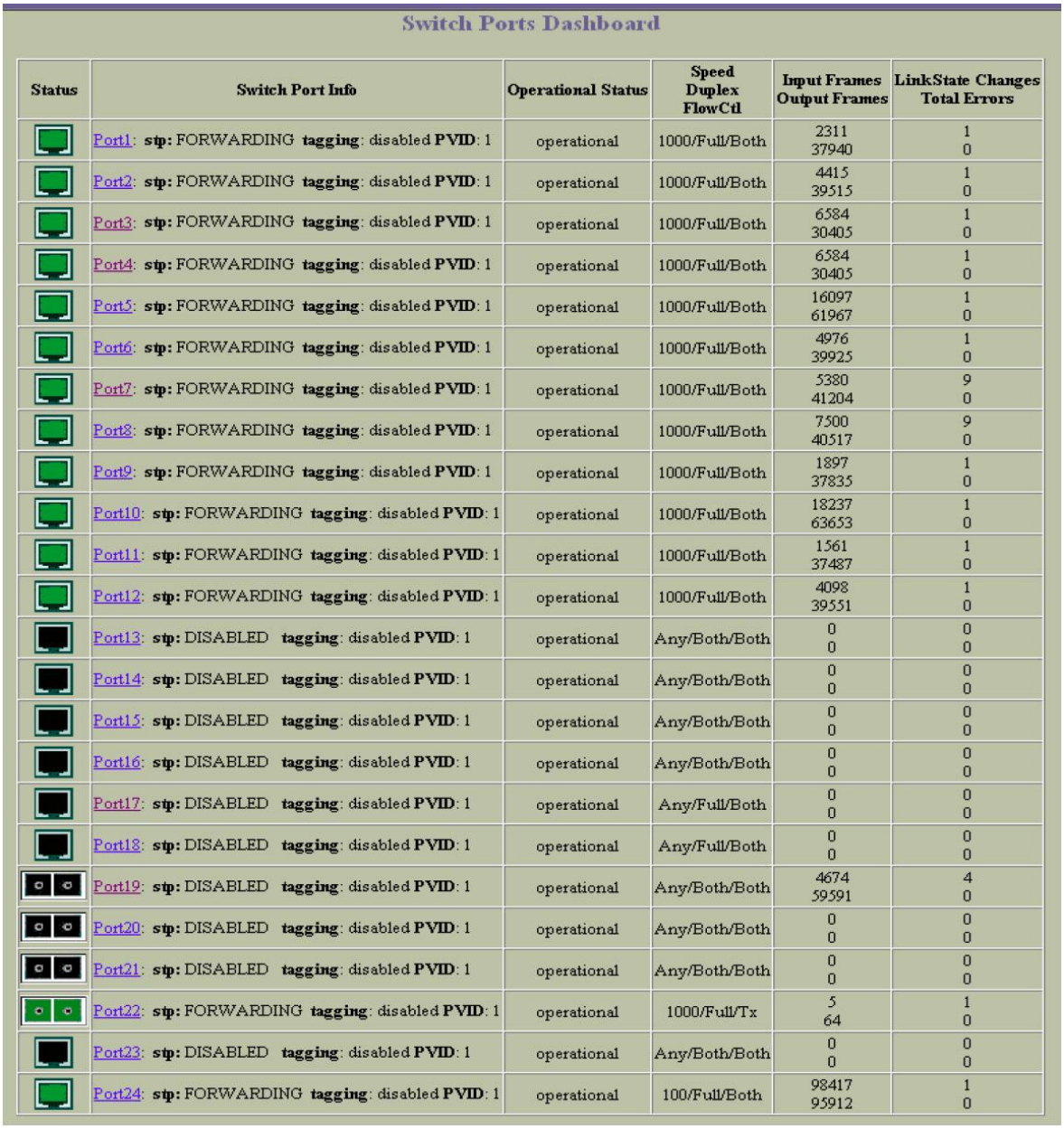
Verifying VLAN settings

After disabling the XConnects, verify that each port used in the iSCSI setup is enabled and is part of the same VLAN. To do this, click **DASHBOARD** at the top of the BBI main window and navigate to Switch >> Switch Ports (Figure 46). Ports 1 to 12, 22, and 24 are operational and enabled.

NOTE:

All ports are members of the same VLAN (PVID 1).

Verify the VLAN settings for Interconnects A and B.



Switch Ports Dashboard

Status	Switch Port Info	Operational Status	Speed Duplex FlowCtl	Input Frames Output Frames	LinkState Changes Total Errors
	Port1: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	2311 37940	1 0
	Port2: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	4415 39515	1 0
	Port3: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	6584 30405	1 0
	Port4: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	6584 30405	1 0
	Port5: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	16097 61967	1 0
	Port6: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	4976 39925	1 0
	Port7: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	5380 41204	9 0
	Port8: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	7500 40517	9 0
	Port9: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	1897 37835	1 0
	Port10: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	18237 63653	1 0
	Port11: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	1561 37487	1 0
	Port12: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Both	4098 39551	1 0
	Port13: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	0 0	0 0
	Port14: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	0 0	0 0
	Port15: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	0 0	0 0
	Port16: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	0 0	0 0
	Port17: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Full/Both	0 0	0 0
	Port18: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Full/Both	0 0	0 0
	Port19: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	4674 59591	4 0
	Port20: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	0 0	0 0
	Port21: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	0 0	0 0
	Port22: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	1000/Full/Tx	5 64	1 0
	Port23: **stp:** DISABLED **tagging**: disabled **PVID**: 1	operational	Any/Both/Both	0 0	0 0
	Port24: **stp:** FORWARDING **tagging**: disabled **PVID**: 1	operational	100/Full/Both	98417 95912	1 0

Figure 46 Switch Ports Dashboard

Configuring p-Class Blade server network settings

Depending on the model, each p-Class Blade server has two or four network interfaces. These interfaces are split between Interconnect A and Interconnect B. To ensure proper multi-path setup, one interface from each interconnect is assigned a unique static IP address. In this example, 20.20.20.230 is the IP address for one network interface, and 20.20.21.230 is the IP address for the other network interface (Figure 47).

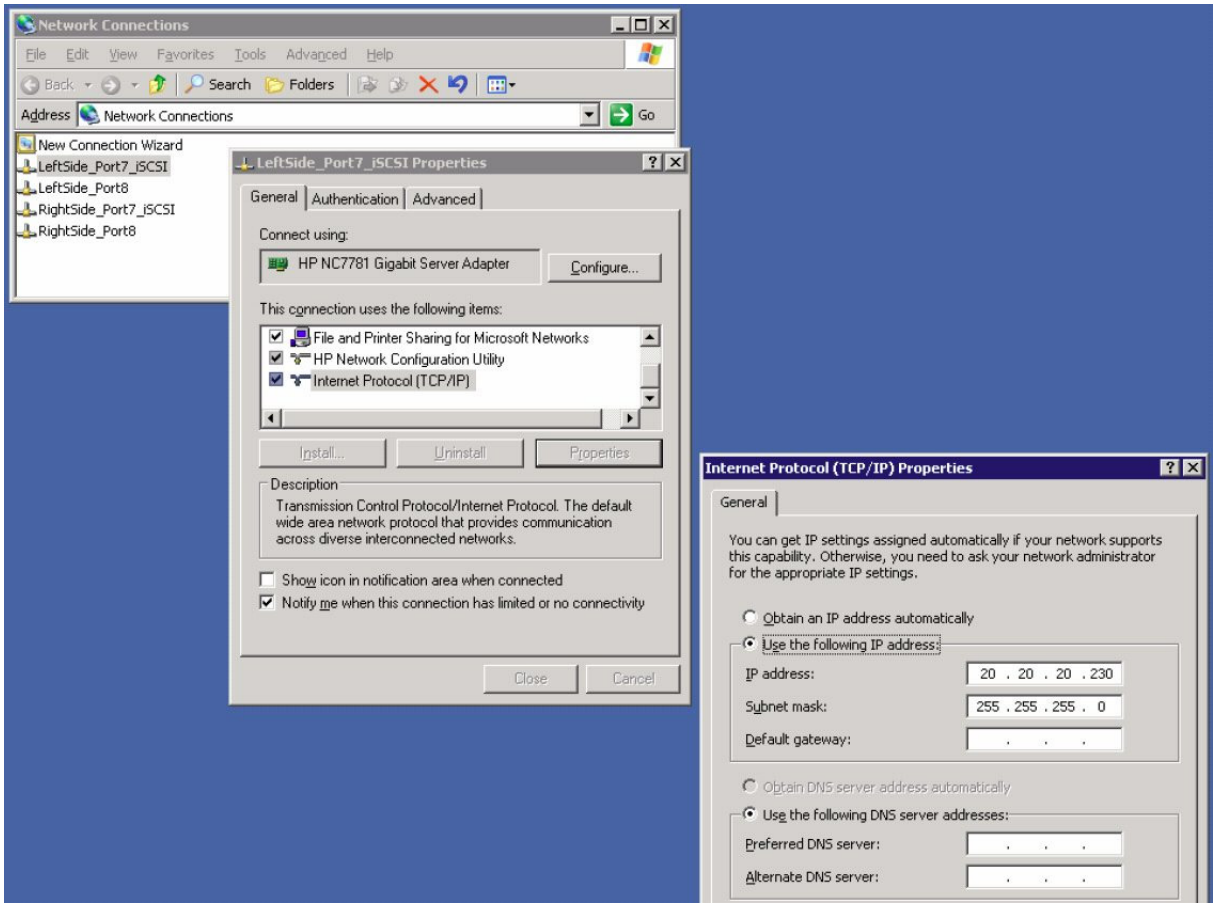


Figure 47 Assigning a static IP to a network interface